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**BASELINE BIOLOGICAL CHARACTERIZATION OF THE TERRESTRIAL
AND AQUATIC HABITATS**

AT

THE ROCKY FLATS PLANT

FINAL REPORT

**U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant
Golden, Colorado**

SEPTEMBER 1992

ADMIN RECORD

SW-A-005598

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GLOSSARY OF TERMS

alluvial fans	gently sloping fan-shaped deposits of sediments deposited where velocity of flowing water in streams decreases
arthropods	members of the phylum Arthropoda, which includes crustaceans, insects, and spiders
autotrophic	an organism capable of manufacturing its own food (e.g., a photosynthetic plant)
basal	relating to, situated at, or forming the base
baseline	a measure of present conditions
belt transects	a data collection area that is of a specific length and width
benthic	organisms living on the bottom of water bodies
benthic macroinvertebrates	invertebrates, larger than single cell plankton, that are unable to pass through a 256 μ m screen (e.g., insect larvae and crayfish)
bryophytes	mosses and liverworts
caliche	a hard soil layer cemented by calcium carbonate, found in desert or semiarid climates (hardpan).
candidate species	a plant or animal species which is a candidate for listing on the Federal Endangered Species List
carnivores	predatory organisms that eat animals
Chinook	a warm wind blowing down the east slope of the Rocky Mountains, that causes a rapid rise in temperature
class	a category used in the taxonomic classification of organisms that consists of similar or closely related orders
colluvium	a loose, heterogeneous deposit of soil and rock debris accumulated on a base of a slope and deposited by sheet wash and downslope creep

GLOSSARY OF TERMS

(continued)

community	an interacting population of various species in a common location
consumer	an animal that feeds upon other organisms in a food chain
Cretaceous	a geologic time period that was the last of three periods in the Mesozoic era spanning the time 135 to 65 million years ago
crown	the widest part of a plant, often at ground level for herbaceous plants, or the head of the foliage of a tree or shrub
detritivore	an organism that feeds on dead organisms or partially decomposed organic matter
diurnal	occurring or active during daylight hours rather than at night
diversity	a measure of the variety of species in a community that takes into account the relative abundance of each species
divide	a ridge of land that separates watersheds
ecosystem	an ecological community, or group of communities, together with the physical environment, considered as a unit
endangered species	plant or animal species which are in danger of extinction
families	taxonomic categories, ranking below order and above genus
floristic composition	the plant species composition within an ecosystem
foliar cover	the leaves of a plant forming crown cover above the ground
food web	the totality of interacting food chains
forb	a broad-leaf herbaceous plant
genus	a taxonomic category ranking below family and above species
grab sampler	sampling device to collect qualitative samples

GLOSSARY OF TERMS
(continued)

graminoid	a grass or grasslike plant
grassland	an area, such as a prairie or meadow, of grass or grasslike vegetation
habitats	a place or type of environment where a plant or animal naturally or normally lives and grows
herbaceous cover	the leaves of forbs or grasses (nonwoody plants) growing above ground level
herbivores	animals that feed on plants
hogback	a sharp ridge with steeply sloping sides produced by geologic uplift
hydric	of, or relating to an abundance of moisture
hydrologic gradient zone	an area with a similar level of soil moisture
insectivore	an animal that eats insects
lagomorph	a member of the taxonomic order including rabbits, hares and pikas
larvae	the juvenile stage in the life cycle of most invertebrates, amphibians and fish
leachate	a solution containing dissolved materials resulting from water infiltration through a deposit or soil
lichen	a type of plant consisting of a fungus and an algae living in a symbiotic relationship
loams	soils consisting mainly of clay, sand, silt, and organic matter
marshland	a standing water habitat, or low-lying wet area
mesic	of, or relating to a medium amount of moisture

GLOSSARY OF TERMS

(continued)

montane	of, relating to, growing in, or being in the biogeographic zone that is made up of relatively moist cool upland slopes below timberline
niche	the role of an organism in its environment
nocturnal	active at night
omnivores	animals that eat both animal and vegetable materials
Operable Unit #1	a designated area of RFP surrounding the 881 Building and 881 Hillside, including the SID, that required evaluation under CERCLA regulations
order	a category used in the taxonomic classification of organisms that consists of one to several similar or closely related families
organisms	living individuals, either plant or animal
perennial	a plant having a lifespan of more than 2 years
periphyton	organisms that live attached to underwater surfaces
photosynthesis	the chemical process by which green plants synthesize organic compounds from carbon dioxide and water in the presence of sunlight
phylum	a category used in the taxonomic classification of organisms that consists of one to several similar or closely related classes
physiognomic	of, or relating to, physical features
phytoplankton	minute floating aquatic plants
prairie	an extensive area of flat rolling grassland
primary producer	plants that can use sunlight as an energy source to produce carbohydrates

GLOSSARY OF TERMS

(continued)

Quaternary	a geologic time period that was the second period of the Cenozoic era spanning the time 3 million years ago to the present
radioecology	the study of interaction of ecological communities and radiations or radioactive substances
raptor	a bird of prey
relative abundance	proportional representation of a species in a sample or a community
riparian	relating to, or living, or located on the bank of a natural watercourse
sedimentary	geologic deposits formed from sediments or fragments transported by water or air
semiarid	a climate characterized by light rainfall (10 to 20 inches of annual precipitation)
shrubland	an area covered predominantly by shrub species
soil series	the smallest recognizable subdivision of the classification system for soils
species	a group of actually or potentially interbreeding populations
species richness	the total number of species in a given taxonomic category
subcommunity	an association of plants that in combination form plant communities
subspecies	a group of individuals within a species that are isolated from, or breed more freely among themselves than with other members of the species
substrate	a surface on which a plant or animal grows or is attached

GLOSSARY OF TERMS
(continued)

Surber sampler	a quantitative sampler used for collecting benthic macroinvertebrates samples from stream bottoms
surficial	of, pertaining to, or occurring on the earth's surface
syncline	a troughlike fold in bedrock, in which the strata are inclined together from opposite sides and the core of which contains younger rocks
taxa	taxonomic groups or the names applied to taxonomic groups
taxonomic	a scientific classification category for plants or animals
terraces	a flat, narrow strip of ground, having steeply sloping sides
terrestrial	of or relating to land as distinct from air or water
threatened species	a plant or animal species that is extremely rare, but not yet threatened with extinction
trophic level	one of the hierarchical strata of a food web characterized by organisms which are the same number of steps removed from the primary producers
uplands	the higher parts of a region or tract of land
vascular cryptogams	flowerless and seedless plants that reproduce by spores
vascular plants	flowering plants characterized by a system of specialized conductive and supportive tissue
woodland	land having a cover of trees and shrubs
xeric	of, or characterized by, or adapted to extremely dry habitat
zooplankton	minute floating animal life of a body of water

LIST OF ACRONYMS AND ABBREVIATIONS

ac	acre
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cm	centimeter
cm ³	cubic centimeters
CMLRB	Colorado Mined Land Reclamation Board
EA	environmental assessment
EE	environmental evaluations
EIS	environmental impact statements
EMAD	Environmental Management and Assessment Division
EMD	Environmental Management Document
ft	foot/feet
ha	hectare
in	inch(es)
km	kilometer
km/h	kilometers per hour
m	meter(s)
m ²	square meters
mg/l	milligrams per liter
mi	mile
mph	miles per hour
NEPA	National Environmental Policy Act
pH	the negative log of hydrogen ion concentration
PPA	property protection area (formerly called "buffer zone")
RFP	Rocky Flats Plant
SID	South Interceptor Ditch
SOP	standard operating procedure
USFWS	U.S. Fish and Wildlife Service
°C	degrees Centigrade
°F	degrees Fahrenheit

EXECUTIVE SUMMARY

Rocky Flats Plant (RFP) is a government-owned, contractor-operated facility that has been part of the nuclear weapons support program since 1951. Baseline information on plant and animal populations and habitats at RFP was collected during 1991 through early spring 1992. The purpose of the baseline study was to provide general ecological information on this 2,652 hectares (ha) (6,550 acres [ac]) reservation located in northern Jefferson County, approximately 25 km (16 mi) northwest of Denver, Colorado. This report was designed to be responsive to National Environmental Policy Act (NEPA) requirements in providing baseline data for future environmental impact statements (EIS) and environmental assessments (EA). The main objectives were to: (1) compile a list of plant and animal species occurring at RFP site; (2) collect data on relative abundance and habitat preferences for plant and animal species; (3) develop baseline information for use in future documents; and (4) provide a document that will serve as a benchmark for future ecological studies.

There were over 1,232 taxa of plants and animals based on sampling distributed among the three RFP watersheds: Woman Creek, Walnut Creek, and Rock Creek. Terrestrial communities had 532 species of plants and 300 taxa of animals; aquatic communities had 236 species of plants and 164 taxa of animals. The total areal percentage by plant community groups (e.g., woodlands), was as follows: grasslands with 82.3 percent (2,183 ha; 5,393 ac); disturbed areas (e.g., the industrial complex), that were formerly grasslands with 12.0 percent (318 ha; 785 ac); shrublands with 1.6 percent (43 ha; 107 ac); woodlands with 0.7 percent (20 ha; 49 ac); and marsh with 3.3 percent (88 ha; 216 ac). The ecological importance of these community types at RFP was not necessarily proportional to areal extent. For example, one of the most important cover types for wildlife was the riparian woodlands community which accounted for only 0.5 percent (13.5 ha; 33 ac) of the habitat area at RFP. Animals inhabited specific plant communities because the communities provided the proper balance of water, food, and shelter.

The most important factor affecting species diversity in plant communities was the amount of moisture available to support plant growth. Six separate types of plant communities were distributed among three hydrologic gradient zones at RFP: xeric zone—dry; mesic

zone—moderate moisture; and hydric zone—wet. Plant communities were identified based on the plant species found in these zones.

The xeric zone, located on hilltops, occurred on 18 percent (481 ha; 1,189 ac) of RFP and contained 91 species of plants. The two plant communities found in this zone were xeric mixed grasslands and ponderosa pine woodlands. Most of the xeric mixed grasslands occurred in Rock Creek (56 percent) and Woman Creek (36 percent) watersheds. Mule deer used this zone for breeding grounds in the fall and foraging areas in winter. Forage was more available in the winter because a combination of wind displacement and solar melting eliminated the snow cover in xeric habitats earlier than in the other two zones.

The mesic zone, located on hillsides, occurred on 77 percent (2,038 ha; 5,033 ac) of the site and contained 149 species of plants at RFP. Two plant communities were found in this zone, mesic mixed grasslands and tall upland shrub. Mesic mixed grasslands occurred primarily in Woman Creek (43 percent) and Walnut Creek (40 percent) watersheds. The abundant small mammal population in these communities provided a reliable food supply for predators like raptors and coyotes while deer fed in the grassland communities. Ninety-nine percent (11 ha; 28 ac) of the tall upland shrub community was located in the Rock Creek watershed. This habitat provided an important mule deer birthing area and nesting habitat for owls, magpies, and shrubland songbirds.

The hydric zone, located on valley floors and near stream channels, occurred on 5 percent (133 ha; 329 ac) of RFP. This very diverse plant habitat contained 208 species in the riparian woodland community, and 162 species in the marsh community, which consists of wet meadow, rushes, cattails, and open water. The riparian woodland community occurred primarily in Woman Creek watershed (70 percent). The riparian woodland community was the most important nesting area for songbirds. The marsh community provided three percent of the habitat (88 ha; 216 ac) at RFP and occurred primarily as the result of irrigation ditching and construction of impoundments. Marshland habitat was distributed in all three watersheds with the majority (42 percent) located in Woman Creek. The marsh community provided habitat that attracted

waterfowl, and along with the riparian woodland community, was the location of most observations of snakes, skunks, and raccoons that were attracted by food availability. This community was an important nesting habitat for red-wing blackbirds, marsh wrens and common yellowthroats. Mule deer frequently used the habitat for feeding in early springtime and bedding during hot periods of the summer.

Several rare species, protected by the Federal Endangered Species Act or that are on the list of Colorado Species of Special Concern (CNAP) were observed at RFP during the baseline study. Forktip threeawn, a Colorado listed species, was the only rare plant found at RFP. Two Federally listed endangered wildlife species were sighted at RFP, although these species were not considered to be residents, i.e., to nest or roost there. These endangered species were the peregrine falcon and bald eagle. Federal candidate species observed at RFP were the ferruginous hawk, loggerhead shrike, and Preble's meadow jumping mouse.

1.0 INTRODUCTION

1.1 PURPOSE

The purpose of this Baseline Biological Characterization of the Terrestrial and Aquatic Habitats at the Rocky Flats Plant (baseline study) was to provide general ecological information on the Rocky Flats Plant (RFP) site. This report was designed to be responsive to National Environmental Policy Act (NEPA) requirements in providing baseline data for future environmental impact statements (EIS) and environmental assessments (EA).

1.1.1 Objectives

The objectives of the baseline study were to: (1) compile a list of plant and animal species occurring at RFP site; (2) collect data on relative abundance and habitat preferences for plant and animal species; (3) develop baseline information for use in future documents; and (4) provide a document that will serve as a benchmark for future ecological studies. The data used in this report was semiquantitative and not intended for quantitative ecosystem level analyses. For example, not all plant and animal groups were sampled.

1.2 BACKGROUND

Rocky Flats Plant is a government-owned, contractor-operated facility that has been part of the nationwide nuclear weapons complex since 1951. Since January 1, 1990, EG&G Rocky Flats, Inc., has been the operator. The RFP site (Figure 1.2-1) is located in northern Jefferson County, Colorado, approximately 25 kilometers (km) (16 miles [mi]) northwest of Denver and consists of approximately 2,652 hectares (ha) (6,550 acres [ac]) of land in Sections 1 through 4 and 9 through 15 of T2S, R70W, 6th Principal Meridian. Rocky Flat Plant administrative and production buildings are within a centrally located, approximately 156 ha (384 ac) industrial area protected by security fences. The remaining peripheral area, known as the property protection area (PPA), provides a buffer zone of approximately 2,496 ha (6,166 ac). The original purchase of land for RFP in 1951 included 1,020 ha (2,520 ac); in 1974 an additional 1,632 ha (4,030 ac) was acquired to expand the size of the PPA.

The original mission of RFP was the fabrication of nuclear weapon components from plutonium, uranium, and nonradioactive metals (principally beryllium and stainless steel). Parts made at RFP were shipped elsewhere for assembly. In addition, RFP reprocessed components removed from obsolete weapons to recover plutonium.

The Rocky Flats Plant is located in a rural area of Jefferson County adjoining undeveloped rangelands that are encroached by housing developments to the northeast, east, and southeast. About 9,100 people lived within 8 km (5 mi) of RFP in 1989, primarily toward the southeast (DOE 1990). Several new subdivisions have been created a few miles east of the PPA. Boulder County Open Space land adjoins the RFP to the north. Some adjacent land to the south, primarily in a strip along State Highway 72, is occupied by industrial facilities. Standley Lake recreation area is to the east of RFP. Several ranches are located within 16 km (10 mi) of RFP, primarily in Jefferson and Boulder Counties.

The 2,496 ha (6,166 ac) PPA, except for several commercial operations, is currently wildlife habitat. County and privately owned clay and gravel pits are operated along the western boundary, and a federally operated experimental wind generation facility is located in the northwest corner. Future mineral mining operations may disturb several hundred acres in the western half of the plant site.

Prior to establishment of the weapons facility at RFP, the area was rangeland. The former Lindsay Ranch buildings can be seen in a meadow near a Rock Creek tributary northwest of the industrial area. Barnyard grasses and weed species, as well as a few apple trees, grow around the relic barn and outbuildings. The remains of an unfinished railroad bed extends to the northwest from the industrial area. Some ponderosa pines have become established along this railroad bed. The pattern of established trees suggests inadvertent introduction of seed by railroad workers' firewood supplies. An historic stage stop was formerly located just south of the present industrial area in Section 15; there is an old apple orchard that may have been planted by stage stop operators.

2.0 DESCRIPTION OF ENVIRONMENT

2.1 DEFINITION OF HABITAT

Within the setting just described climate, physiography and topography, geology and soil type, and surface water availability collectively determine the habitats available for plants and animals. Habitat is defined as the place or type of environment where a plant or animal naturally or normally lives and grows. Many physical and biological factors contribute to the creation of a habitat. Habitats must satisfy the same basic needs for plants and animals. These basic requirements include nutrients, water, and shelter which provide conditions conducive for reproduction.

Habitat requirements of plants are more dependent on the physical factors of their environment such as climate, topography, water availability, soil type and pH, and light intensity. Because they root in one place, all habitat requirements for plants must be present in a given location. Animal habitat requirements are more complex and include the physical factors of water availability, shelter, topography, and climate, as well as breeding areas, food availability, and cover from predators. Since animals are mobile, they can seek to satisfy habitat requirements in more than one specific location. Plants provide many of the habitat requirements for animals. For example, animals depend directly or indirectly on plants for food, shelter, and concealment; thus plant communities provide essential elements of animal habitats.

The physical attributes that collectively determine plant and animal habitats are determined below. The plants and animals that occupy these habitats are then characterized briefly.

2.2 CLIMATE

Temperatures at RFP are moderate with cold and hot extremes usually of short duration. The historic temperature extremes have ranged from -34 degrees Celsius (°C) (-29 degrees Fahrenheit [°F]) in February 1989 to 39°C (102°F) in July 1971 (USDA 1980). January, the coldest month, has an average daily minimum temperature of -8°C (18°F). Average daily temperatures in winter range from -7 to 7°C (20 to 45°F). July, the hottest month, has an average daily maximum temperature of 29°C (85°F). Average daily temperatures in summer range from 13 to 29°C (55 to 85°F), though short periods may be much hotter. The temperature range affects the plant

growing season, the number of consecutive days when minimum daily temperatures exceed 0°C (32°F) from spring until fall. At RFP the growing season can be expected to continue from May 14 until September 28 during 50 percent of the years (USDA 1980). This 136-day period is very important for the ecosystem because annual plants produce minimal new growth in the spring until after the last frost and they die-off following the first freeze in the fall. The quality and quantity of plants available as food for animals, as well as the success of plant species competing with other plants for habitat are affected annually by the growing season.

The total annual precipitation is 38 centimeters (cm) (15 inches [in]) in the RFP area. Of this amount, 70 percent usually falls in April through September. The heaviest 1-day rainfall during the period of record was 9.4 cm (3.7 in) in 1969. Thunderstorms occur about 40 days each year, mostly in summer. The average seasonal snowfall is about 165 cm (65 in). The greatest snowfall at any one time during the period of record was 56 cm (22 in).

The average relative humidity in midafternoon is about 40 percent. Humidity is higher at night, and the average at dawn is about 60 percent. The sunshine is not blocked by clouds 70 percent of the time in summer and winter. The prevailing wind is from the northwest. The highest average wind speed, which occurs in spring, is 16 kilometers per hour (km/h) (10 miles per hour [mph]). The wind rose in Figure 2.2-1 provides a graphical illustration of average wind speeds from 1989 and 1990; this information is summarized in Table 2.2-1.

2.3 PHYSIOGRAPHY AND TOPOGRAPHY

The environment at RFP is influenced by the site's proximity to the Front Range of the Rocky Mountains and its location on a broad, eastward sloping plain of coalescing alluvial fans. As shown on U.S. Geological Survey maps, the Front Range trends north-south at elevations of about 2,990 meters (m) (9,800 feet [ft]) above sea level, with elevations increasing to 4,000 m (13,000 ft) along the Continental Divide about 25 km (16 mi) west of RFP. The elevation of RFP varies from 1,890 m (6,200 ft) at the western boundary to 1,722 m (5,650 ft) at the southeastern corner. This elevation difference of 168 m (550 ft) over a distance of 6.4 km (4 mi) suggests gently sloping country. However, as illustrated by the contour map in Figure 2.3-1, the western terraces and the divides between the three creek drainages, including the ridge upon

which the industrial area is located, are quite flat. The creek drainage slopes vary from moderate in lower Woman and Walnut Creeks to quite steep in upper Rock Creek. The stream channels of Woman and Walnut Creeks vary in elevation from about 1,874 m (6,140 ft) to 1,722 m (5,650 ft) from west to east. The Rock Creek stream channel varies in elevation from about 1,896 m (6,220 ft) to 1,740 m (5,710 ft). Differences in the eroded depth of the three stream channels at RFP has resulted in formation of different soil-forming materials in Rock Creek than in Woman and Walnut Creeks, which have similar soils. Rock Creek's steeper ravines have a southwest-to-northeast orientation, while the other two creeks have wider valleys that trend west to east. This difference in aspect and slope can influence soil moisture, and thereby the habitat available for plant community formation. Minor rock outcrops occur largely in the northwest corner of the PPA. This topographic feature strongly influences the community structure there.

2.4 GEOLOGY AND SOILS

Rocky Flats Plant is located just east of the Front Range in the Denver Basin - an asymmetrical, north-south trending syncline with a steeply dipping western limb and a shallowly dipping eastern limb. The Denver Basin contains more than 3,000 m (9,840 ft) of Pennsylvanian to Cretaceous sedimentary deposits. Geologic units at RFP consist of unconsolidated surficial material and bedrock. Cretaceous deposits of the Arapahoe Formation, Laramie Formation, and Fox Hills Sandstone are unconformably overlain by Quaternary alluvial gravels, colluvial deposits, and artificial fill. Fox Hills and Laramie Formation sandstones form a prominent hogback that strikes north-northwest from Leyden Gulch to the town of Marshall. Immediately west of RFP where the hogback is not visible, these sandstones are exposed in clay and gravel pits excavated through the Quaternary gravels. Soils are from several soil series, derived from surficial geologic formations.

2.4.1 Soils

The surface soils at RFP are chiefly moderately deep, well-drained clay, cobbly clay, and sandy loams, with moderate to low permeability. Soil types at RFP are shown in Figure 2.4-1. Bottomland (floodplain and low terraces) soils are largely stratified loamy alluvium, made up of mesic Ustic Torrifluvents from the Haverson series. The Haverson series is well drained and commonly found on slopes of 0 to 9 percent. Soils of the terraces and the upper hillsides, where

gravel and cobbles are common, are represented by combinations of Denver and Kutch series. Both of these soil series are well drained, deep (Denver) to moderately deep (Kutch), and are found on moderately steep slopes, 0 to 15 percent and 5 to 25 percent for Denver and Kutch, respectively. These mesic Torric Argiustolls are sandy loam formed from Rocky Flats Alluvium. Lower hillsides and areas toward the eastern boundary of RFP have soils from the Standley, Nunn, and Valmont series, which are largely mesic Ardic Argiustolls (USDA 1980). These soils are deep and well drained that vary in slope. The slope for Standley, Nunn, and Valmont series are 0 to 60, 0 to 25, and 0 to 3 percent, respectively.

2.4.2 Surficial Geology

Surficial material consists of Quaternary and Recent valley fill alluvium, alluvial fan deposits of the Rocky Flats Alluvium, colluvium, and artificial fill. Remnants of terrace deposits younger than the Rocky Flats Alluvium, such as the Verdos, Slocum, and Louviers Alluvium, occur topographically below the Rocky Flats Alluvium but have not been mapped in the vicinity of RFP (DOE 1992).

The Quaternary Rocky Flats Alluvium is the oldest alluvial deposit at RFP and is closest to the surface (Scott 1965). This deposit is an alluvial fan that occupies an extensive erosional surface beneath RFP. The alluvium ranges up to 30 m (100 ft) in thickness and is thickest west of RFP near the apex of the fan and thinnest just east of RFP near the depositional limit of the fan. The Rocky Flats Alluvium is 3- to 6-m (10- to 20-ft) thick across RFP where it forms the crest of the uplands as a uniform blanket-like deposit on the terraces. This deposit is composed of poorly sorted, coarse, bouldery gravel in a sand matrix with lenses of clay, silt, and varying amounts of caliche. Streams have dissected the deposit, and it was completely eroded in the lower reaches of the Woman Creek, Walnut Creek, and Rock Creek drainage.

Colluvium blankets the valley slopes below the uplands on which the Rocky Flats Alluvium was deposited. Colluvial materials have been deposited in thicknesses of 0.3 to 9 m (1 to 30 ft) by slope wash and the downward creep of Rocky Flats Alluvium and bedrock. The colluvium consists predominantly of clay with lenses of silt, sand, and gravel.

Valley fill alluvium makes up the channel and terrace deposits along the creek bottoms. The alluvium is 1- to 3-m (3- to 10-ft) thick and is derived from reworked and redeposited alluvium and bedrock. This deposit is composed of organic-rich, poorly sorted, coarse gravel in a clayey sand matrix, and forms sinuous, narrow deposits in the valley bottoms.

2.4.3 Bedrock Geology

Alluvial material is unconformably underlain by Cretaceous sedimentary rocks of the Arapahoe Formation, Laramie Formation, and Fox Hills Sandstone. The Arapahoe Formation is 0- to 37-m (0- to 120-ft) thick in the vicinity of RFP and is estimated to be 5- to 8-m (16- to 26-ft) thick under the central portion of the plant (DOE 1992). The underlying Laramie Formation is informally subdivided into two members—an upper claystone member and a lower sandstone member. The upper claystone member is 90- to 150-m (300- to 500-ft) thick and the lower sandstone member, which, along with the Fox Hills Sandstone, subcrops in the clay and gravel pits west of the industrial area, occurs 90 to 250 m (30 to 820 ft) below the Rocky Flats Alluvium in the central portion of the facility.

2.5 GROUNDWATER

As defined in the "Final Ground Water Assessment Plan for Rocky Flats" (DOE 1992), the uppermost aquifer at RFP is comprised of the Rocky Flats Alluvium, valley fill alluvium, colluvium, bedrock sandstones, and weathered claystones of the Arapahoe and Laramie Formations. In general, groundwater in the uppermost aquifer occurs under unconfined conditions.

According to Hurr (1976), sitewide groundwater flow at RFP moves from the higher elevations in the west toward the lower drainages in the east. Sources of groundwater recharge to the uppermost aquifer include infiltration of precipitation, snowmelt, and surface water in ditches, streams and ponds. Discharge occurs through evapotranspiration from plants and as seeps when the water table intersects the ground surface or surface water features such as streams, ditches, ponds, or stream-eroded valleys. Groundwater levels at RFP rise annually in response to spring recharge and decline the remainder of the year as less precipitation occurs.

Recent hydrological investigations at RFP indicate that the uppermost aquifer as described by Hurr (1976) is not uniformly saturated. Figure 2.5-1 shows groundwater elevations at RFP. As illustrated, saturated conditions in these surficial units may be encountered at the surface (near surface seeps) or may not be encountered at all in these units depending on localized hydrogeological conditions. Because the surficial units are bounded below by lower permeability claystones of the Arapahoe and Laramie Formations, little interaction of groundwater between the upper and lower systems is expected. In fact, in some locations the saturated surficial units appear to be perched above the low permeability claystones of the lower hydrostratigraphic units.

2.6 SURFACE WATER

Surface water originates from two major sources at RFP. The most important sources for the formation and maintenance of the aquatic ecosystem are groundwater discharges that form springs and seeps in numerous places along the creeks at RFP. These seeps and springs are perennial discharges that augment streamflow and provide stable habitats for aquatic organisms. Surface water runoff also contributes water to the ecosystem; but, in the semiarid climate of the Front Range, precipitation is sparse, and the hot dry winds can evaporate water at the soil surface. The presence of perennial marshland and riparian communities greatly increases the plant and animal species diversity of RFP.

The three intermittent headwater streams in the South Platte River drainage basin flow generally from west to east across RFP. These watersheds, shown in Figure 2.3-1, are Woman Creek, Walnut Creek, and Rock Creek (in order of occurrence from south to north). Woman Creek and Walnut Creek are tributaries of Big Dry Creek. Rock Creek flows into the drainage system composed of Coal Creek and then St. Vrain Creek. Major impoundments within the watersheds are generally maintained at 10 to 50 percent of maximum volume.

Woman Creek – Woman Creek watershed drains the approximately 1,144 ha (2,827 ac) south of the industrial area and the east-west access road, flowing into Standley Lake, a water supply reservoir. Standley Lake discharges into Big Dry Creek. The channel length of Woman Creek on the RFP reservation is about 5 km (3.1 mi). The impoundments in the Woman Creek main channel include one stormwater detention pond, Pond C-1 (maximum volume 1.7 million gallons

[MG], located in the Woman Creek channel and a catchment and detention pond, Pond C-2 (maximum volume 22.6 MG), located at the end of the South Interceptor Ditch (SID). The SID and Pond C-2 system collects treated groundwater and surface water runoff from the industrial area. While this catchment system is within the Woman Creek drainage area, it was designed as a closed system with no surface discharge into Woman Creek. Water collected in Pond C-2 is pumped via an above-ground pipeline to the Broomfield Diversion Ditch. An emergency option exists for pumping water from Pond C-2 to either Pond A-4 or B-5 in Walnut Creek. Smart Ditch begins at Rocky Flats Lake and was constructed along the southern part of RFP. Two irrigation detention ponds located in the southeast corner of the PPA are part of the Smart Ditch system. These ponds are referred to D-1 (normally filled) and D-2 (usually dry).

Walnut Creek – An east-west trending topographic divide between Woman Creek and Walnut Creek causes a portion of the industrial area to drain into Walnut Creek. Walnut Creek watershed drains approximately 879 ha (2,170 ac) in the northeastern and central portions of RFP. The channel length of Walnut Creek on the RFP reservation is about 7 km (4.3 mi). Walnut Creek consists of two forks on RFP; they are Walnut Creek and South Walnut Creek, which drain the northeastern and central portions of RFP, respectively. The A-series detention ponds, A-1, A-2, A-3, and A-4, had maximum volumes of 1.0, 6.0, 12.4 and 32.5 MG, respectively, in the Walnut Creek channel. The nondischarging Landfill Pond (maximum volume 7.2 MG), located just north of the industrial area, is at the head of an unnamed tributary entering Walnut Creek. The B-series detention ponds, B-1, B-2, B-3, B-4, and B-5, had maximum volumes of 0.6, 1.8, 1.5, 0.6, 0.2 and 24.0 MG, respectively, in the South Walnut Creek channel. The Sewage Treatment plant, within the industrial area, drains into Pond B-3. The confluence of these three stream segments that form Walnut Creek is just below Pond A-4. Downstream from the A- and B-series detention ponds, another small impoundment is located at the east boundary of RFP. Immediately beyond the east boundary fence for the PPA, the streamflow from Walnut Creek is diverted around Great Western Reservoir via the Broomfield Diversion Ditch. Great Western Reservoir is located approximately 1 km (0.5 mi) east of the RFP boundary.

Rock Creek – Rock Creek watershed drains approximately 629 ha (1,554 ac) in the northwestern portion of RFP and flows northeast. The channel length of Rock Creek on the RFP reservation is about 4 km (2.5 mi). There are several ponds in the Rock Creek watershed. Lindsay Pond is a stock pond constructed in the channel of Rock Creek on the former Lindsay Ranch property. Two flooded clay and gravel pits located on the terraces west of the industrial area also hold water. These deep pits, which are not expected to have surface discharges, collect some surface flow from the surrounding areas and groundwater discharges.

The RFP reservation is crossed by several of the irrigation ditches in the regional network and drainage canals. McKay Ditch, which carries water across the central to north-central portion of the PPA, flows into Walnut Creek. Upper Church and Smart Ditches carry water from offsite sources across RFP; there are two impoundments on Smart Ditch near the southeast boundary of RFP which temporarily retain water flowing from the ditch. These ponds are called Smart Ditch Pond 1 and Smart Ditch Pond 2 for the purpose of this report.

2.7 PLANT AND ANIMAL COMMUNITIES

Plants and animal communities use the numerous habitats provided by the physical environment just described. A higher number of plant and animal species occur at RFP because of the ecotone effect along the Front Range. As a result two habitat types, prairie and foothills, provide opportunities for diverse communities in this area. Diverse plant communities (interacting populations of various species in a common location) that are a combination of typical prairie and foothill species occur at RFP. Because topography at the site includes gravel-topped plateaus, rocky hilltops, steep hillsides, rock outcrops, gentle hillsides, and perennial spring seeps, a variety of restricted plant communities have become established within RFP boundaries. An example of a restricted plant community is the ponderosa pine woodland that contains ponderosa pine, Douglas-fir, skunkbrush sumac, and common juniper. While this community is common in nearby montane uplands, it is found only as small, isolated islands in the prairie ecosystem. Isolated ponderosa pine woodland communities are located in the extreme northwest corner of RFP (Rock Creek watershed) and near the head of Woman Creek's main channel. Ravine uplands contain wild plum, chokecherry, and hawthorn. Cottonwood and willow woodlands inhabit moist bottomlands. Prickly pear cactus and yucca are common on some uplands.

Wildlife at RFP is typical of species found in similar habitat types throughout the foothills of the Front Range of the Rocky Mountains. A variety of herbivores (plant eaters) provide a diverse selection of prey for the carnivores (meat eaters). Bull snakes, rattlesnakes, racers, and eastern short-horned lizards occur sitewide in many habitats, while western painted turtles and western plains garter snakes occur near moist habitats. Common birds include western meadowlarks, horned larks, red-winged blackbirds, mourning doves, vesper sparrows, house finches, marsh hawks, red-tailed hawks, ferruginous hawks, rough-legged hawks, and great horned owls. Mallards and Canada geese use the small ponds as feeding and breeding areas. The most common medium-sized mammals are black-tailed prairie dogs, desert cottontails, and muskrats, along with a few black-tailed jack rabbits, white-tailed jack rabbits, and porcupines. Movement of wide-ranging large mammals is unimpeded since physical barriers are absent between the RFP site and surrounding foothills. The most common large mammal at RFP is the mule deer. Coyotes, striped skunks, raccoons, and long-tailed weasels are the most common carnivores, with badgers and red foxes observed occasionally. Gray foxes, bobcats, and mountain lions had been reported at RFP, but the baseline study did not document their presence.

Aquatic habitats and communities found at RFP are typical of those occurring in the intermittent streams of the foothills region. Aquatic invertebrates are less affected by intermittent stream flows than are fish species. Therefore, a diverse assemblage of benthic macroinvertebrates including crayfish, mayfly larvae, caddis fly larvae, and midges have widespread distribution in most suitable aquatic habitats. A limited number of fish and amphibian species are found in the streams and impoundments. Several species of fish were introduced by humans. Fish previously collected are typical warmwater species such as largemouth bass, fathead minnows, green sunfish, white suckers, goldfish, and carp.

When RFP was open range, several wildlife species that have now been displaced still occurred. For example, bison herds migrated through the area, and grizzly and black bears moved onto the plains to feed in the spring. Pronghorn, elk, gray foxes, bobcats, and mountain lions have been recorded at RFP within recent times, though they are uncommon in the area. While the habitats required by these species still remain at RFP, bison and grizzlies could only occur through

reintroductions. Other historic species may one day recolonize the area, depending on future wildlife management goals.

The plants and animals just described were characterized from previous data collections.

3.0 METHODS

3.1 APPROACH

A comprehensive review of published literature available through public and university libraries provided background information on plant and animal species in the Rocky Flats area. Many reference books listing local distribution, population, and habitat preference of plants and animals were used. These data and objectives of the study guided development of a framework for the sampling program. Species lists were compiled from previous studies to provide "shopping lists" of potential species expected to be present at RFP and to aid field personnel searching for plant and animal species during the study.

Several studies were heavily used for background information on plant and animal ecology at RFP. Plant communities were researched in 1973 and 1974. A botanical inventory conducted in 1973 provided information on late spring and summer plant species present at RFP (Weber et al. 1974). A vegetation study in 1974 determined the types of plant communities present at RFP (Clark 1977). A later report by the same researcher delineated the plant communities (Clark et al. 1980). Predator-prey relationships for animal communities at RFP were published in 1978 and 1980. An investigation of the summer food habits of coyotes provided information on coyote feeding habits and small mammals species present (Ribic 1978). A study on the distribution and populations of small mammals in upper Rock Creek also provided useful information (Brown 1980). Finally, staff and graduate students at Colorado State University conducted research on mule deer at RFP (Arthur 1977; Alexander 1979, 1980; Alldredge et al. 1990).

Other investigations evaluated radiological impacts on aquatic and terrestrial ecosystems. These investigations included studies at RFP that addressed plutonium effects on aquatic ecosystems (Johnson et al. 1974), plutonium effects on terrestrial environs (Whicker et al. 1974), and biological impacts from wastewater discharges (Zillich 1974).

Following the literature research and preliminary design of the sampling program, field work began. The initial field effort, in the winter of 1991, concentrated on mapping vegetation communities and making a general survey of the terrestrial and aquatic habitats. Information gathered during the initial field effort was used to determine sampling locations for plants and animals. Standard ecological survey methods, as outlined in the Environmental Management and Assessment Division (EMAD) Ecology Standard Operating Procedures (SOPs) (DOE 1991), were used for all surveys as outlined below. References used for taxonomic identification of organisms are listed in Appendix A.

3.2. TERRESTRIAL STUDY METHODS

The terrestrial baseline survey was designed to characterize current ecological conditions at RFP. Data collected for the Operable Unit 1 (OU1) Environmental Evaluation (EE) at RFP has been included in the baseline report. Ecological components studied included populations and communities of plants and several animal groups such as arthropods, amphibians, reptiles, birds, and mammals. The period of data collection, January 1991 through February 1992, spanned four seasons that included portions of two consecutive winters. Relative abundance surveys of birds, medium-sized mammals, carnivores, and large mammals were conducted during all seasons including portions of two winters. Animals that are unable to regulate their body temperatures ("cold-blooded"), such as arthropods, amphibians, and reptiles were inactive during cold weather.

For the purposes of the baseline study, the habitats at RFP were divided among three moisture zones: xeric (dry); mesic (moderate moisture); and hydric (wet). Because plant species are sensitive to small variations in moisture, species known to occur in habitats with similar moisture availability were used to identify soil moisture zones. Mapped plant communities were then grouped according to the soil moisture zones they occupied. Each community has a number of characteristic species found interacting with each other under similar habitat conditions. Subcommunities sometimes form as small inclusions within communities. A subcommunity is characterized by a different and less diverse composition of member species and a smaller areal extent than a community. In the semiarid climate, plants in the hydric zone form communities that are limited to narrow bands of high soil moisture. Because these hydric zone communities

(riparian woodland and marshland) were too narrow to sample separately, they were sampled as community complexes (intermingled communities).

The following sections present information on survey methods used for data collection. Terrestrial sample site locations are presented in Figures 3.2-1 and 3.2-2. Note that sampling sites designated with "B" as a suffix were baseline sites, and that sites designated with "A" or "R" as a suffix were OUI EE sites at RFP.

3.2.1 Vegetation Surveys

3.2.1.1 Field Methods

Vegetation Mapping

Mapping plant communities and habitat types was the first phase of the baseline survey. The location and size of distinct habitats were determined from photointerpretations of infrared aerial photographs. The aerial photographs used for mapping were made July 1, 1989. Field verification and map finalization were completed during the summer of 1991. Habitats were identified according to gross characteristics as grassland, shrubland, woodland, marshland, disturbed areas, and structures. The last two categories included disturbed and barren land and developed sites such as buildings, roads, utility lines, and parking areas. Community names within the habitats were based on species composition. The plant communities identified at RFP are summarized in Table 3.2.1-1 and described in detail in Section 4.3.2. The vegetation map, Figure 3.2-3, in addition to portraying the spatial location of distinct plant communities, also presents the habitat classifications used for wildlife studies.

Subcommunities such as short grassland and short upland shrub were individually listed on the plant community map but were field sampled as parts of larger communities. Tree plantings located in the mesic zone were not sampled. Disturbed areas were grouped together and sampled as subcommunities of the mesic mixed grassland, as were reclaimed grassland areas. Riparian woodland communities were sampled as a community complex because they are a conglomerate of several close-knit communities. The marsh communities, including open water, were sampled as a marshland complex.

Vegetation Sampling and Inventory

The baseline vegetation study was designed to provide current information on the plant communities at RFP. The objectives of the vegetation study were to update the plant species inventory and to describe the composition of plant communities.

Vegetation data were collected using standard methods appropriate for classifying and describing plant communities (Mueller-Dombois and Ellenberg 1974; Bonham 1989). These data collection methods, outlined in the SOPs were used to achieve the objectives listed in Section 1.1.1. The SOPs established procedures for data collection. Following initiation of vegetation sampling, some of the methods were modified to increase field efficiency and render data collection more uniform. The SOPs were subsequently revised based on these modifications.

Vegetation communities were selected for sampling after preliminary mapping identified those communities with a large enough extent to provide a uniform sample area (SOP EE.11). Sampling locations were selected to provide data from several widely spaced units of each community type at RFP. Vegetation was sampled within the established small mammal trapping plots and bird survey routes.

Ground cover and species richness were sampled for each selected community (SOP EE.10). Cover data were collected during the late summer final phase using the point-intercept method, while species richness was determined using belt transects. Cover and belt transects were conducted along the same 50-m (164-ft) transect within a given plant community at each sample location. These transects were positioned to begin at the starting point of the corresponding wildlife transect. Species lists for each plant community were developed from all sampling in each community and species identified during preliminary sampling conducted in late spring (April through June 1991). These and other species lists are provided in Appendix B.

Point Intercept Method

Ground cover is the amount of material other than bare soil at the ground surface (e.g., live or dead plant material and rock) (Shimwell 1971). It can also be viewed as a measure of the amount of ground surface that is occupied by live plant stems. This is usually referred to as

basal area cover (Bonham 1989). The point-intercept method of cover sampling recorded ground cover of live vegetation only if the crown of a plant was contacted by the sampling rod at ground level (i.e., is a "hit"). This method was not used to record herbaceous (nonwoody) plant canopy (above ground level leaves or stems) hits. Tree and shrub canopy hits were recorded as tree or shrub canopy cover depending on the height of the vegetation (shrub was less than 3 m [10 ft], tree was greater than 3 m [10 ft] regardless of species). This point-intercept method was adapted from the "Guidelines for Compliance With Land Use and Vegetation Requirements of the Colorado Mined Land Reclamation Board (CMLRB) for Coal Mining" (CMLRB 1988). All field sample methods are biased and have limitations as well as advantages. This method was selected because of its acceptance among the state agencies and because it provides consistent and repeatable results, unlike standard range management techniques, which give only an instantaneous measurement of herbaceous foliar cover. The point-intercept method has the advantage of also providing data that can be interpreted directly into species composition percentages because the transect consists of 100 data points that can be directly interpreted for percentages.

The point-intercept method used a 50-m (164-ft) transect with the ground cover recorded at every 0.5-m (1.6-ft). Intercepts of standing plant material from the current growing season (basal area only) were recorded as hits by plant species. Litter (dead plant material from a previous growing season), bare soil, and rock hits were also recorded according to category. The first hit on foliar cover (leaves or branches) for all woody plants was recorded by species.

Belt Transect Method

To measure species richness (i.e., species diversity), 2 m (6.6 ft) wide belt transects were sampled, in conjunction with point-intercept transects, along the same 50 m (164 ft) length. All stems of trees, shrubs, and cacti more than half contained within the belt were counted and recorded by species to establish woody plant density. All forb (broad leaf herb) and graminoid (grass-like) plant species observed within the belt were also recorded. Density of trees, shrubs, yucca, and cactus were calculated as stems per 100 square meters (m^2) (0.025 ac). Species richness was summarized as the number of species per 100 m^2 (0.025 ac).

3.2.1.2 Data Analyses

The goals in analyzing the data for each community were to determine vegetation cover and percent, and species composition and frequency of occurrence within each community. Ground cover summaries (Appendix C) determined frequency of occurrence (hits/100 points) for plant species, litter, bare ground, or rock. Belt summaries (Appendix C) provided species richness per community and summarized woody plant densities for these communities.

3.2.2 Animal Surveys

Some field methods used observations in a specific community or community complex regardless of the animal groups observed (e.g., general surveys). Other field methods were specific to animal groups regardless of community. These methods are described below.

3.2.2.1 Field Methods

General Surveys

Relative abundance surveys designed to document the relative numbers of all observed species in each sample area were used for amphibians, reptiles, medium-sized mammals, carnivores, large mammals, and birds. Permanent transects were established in each community or community complex that was large enough to provide space for a walking survey of at least 45 minutes. Trained observers walked an established route along these survey lines and recorded all animal species observed. The data recorded included the number of individuals, the plant community in which the individuals were observed, and the time spent by the observer in each community. These data allowed the calculation of numbers of a species per hour of observation within a given community. The number per hour figures were then used to determine the relative abundance of each species as compared between communities. Any casual observations of species of special interest (Table 3.2.2-1) were also recorded. Species of special interest were selected for a number of reasons, ranging from representatives of a particular trophic level (coyotes and raptors) to species that are aesthetically pleasing to the public.

Arthropods

Most arthropods were collected using sweep nets in accordance with the SOPs. Supplemental collection involved pitfall traps for ground-dwelling arthropod species and active pursuit of

butterflies and moths. These techniques result in under estimation of soil invertebrates such as earthworms. Sweep netting involves the capture of insects by dislodging them from vegetation. The technique requires brushing the net from side to side across vegetation included within a 50 by 2 m (146 by 6.5 ft) transect. Sweep net collections were made along selected transects within the same sample locations used for vegetation sampling. Organisms collected were killed and preserved in ethyl alcohol for taxonomic identification. Effects on sampling success caused by seasonal and diurnal behavior were recorded in field notes.

Each selected transect was sampled three times during daylight hours in July, August, and September 1991. Security programs at RFP allowed only cursory nighttime sampling of insects attracted by light or bait; therefore, these data are neither comprehensive nor community-specific. High visibility insects, such as butterflies, observed during relative abundance surveys were also recorded.

Amphibians and Reptiles

Amphibian and reptile data were collected only during the course of conducting relative abundance transects and through general observations when sampling other groups because of the low numbers, irregular distribution, and general inconspicuousness of these taxa. Frequency of vocalizations by frogs were also recorded during early morning bird transects. These methods were outlined in the SOP EE.08.

Birds

Bird data were collected in accordance with the SOP EE.07. Emlen transects (permanently established bird survey belt transects) were used to record bird breeding activity and population data. Population data were collected from bird belt transects during all four seasons. Breeding season belt transects (late spring/early summer) began just after dawn and were completed by 10:00 a.m. Surveys were extended later into the day during the fall and winter surveys. During relative abundance transects, all observed birds were recorded. Relative abundance based on numbers observed per unit time was calculated for each community.

Mammals

All classes of mammals were sampled in accordance with methods outlined in SOPs EE.05 and EE.06. Methods varied according to species, and for the purposes of the baseline study mammals were subdivided into several subgroups, but all mammal observations were recorded with reference to the plant communities in which they were observed. Small mammals were collected by trapping, but all other mammal species were recorded from observations during relative abundance surveys or general observations.

Small Mammals

Permanently established small mammal trapping plots varied in configuration depending on the size and shape of the community sampled. Regardless of configuration, however, each small mammal plot contained 25 trap locations separated by 5-m (16-ft) intervals. Each site was trapped on four consecutive nights. Seasonal and diurnal constraints on data collection were adhered to, and professional judgment was used to limit trap mortality. Readily observed small mammals or evidence of species activity was recorded during relative abundance transects.

Medium-Sized Mammals

Medium-sized mammals were represented by prey species such as rabbits, hares, prairie dogs, muskrats, and other mammals of the same relative size. These were species of special interest and, as such, were recorded whenever general observations were made, as well as during relative abundance surveys.

Carnivores

Carnivores included such species as coyotes, badgers, weasels, skunks, and raccoons. As species of special interest, carnivores were recorded whenever observed in addition to observations during scheduled relative abundance surveys. Any potential denning areas or apparent dens discovered during relative abundance surveys, bird surveys, and other types of sampling were documented.

Large Mammals

Large mammals (e.g., mule deer, white-tailed deer, and elk) were recorded primarily during relative abundance transects, performed in all four seasons. All large mammals observed along

relative abundance transects were recorded. Relative abundance based on numbers observed per unit time in each community was calculated. In addition to the quantitative data collection, all general observations of large mammal species were recorded as to species, location, date, and time because of their status as species of special interest. Sitewide large mammal surveys were performed during early winter to document the resident population before any winter die-off.

3.2.2.2 Data Analyses

Data analysis stressed summarization of measures recorded for each taxon sampled. Species presence, richness, and relative abundance were summarized for all sampled taxa. Species presence and species richness are qualitative measurements that reflect the health of an ecosystem. Relative abundance is a semi-quantitative analysis dependent upon passive observation of species. Not all species present during a relative abundance survey will be observed; therefore, only the most obvious (visible or vocal) were recorded. The measurement unit for relative abundance is numbers per unit time.

Additional taxon specific sample summary criteria were measurements of population densities for small mammals and breeding birds. Small mammal species density per hectare was calculated based on animals caught per trap-night during live trapping. Bird density was calculated from data collected along bird survey belt transects during the spring/summer breeding period surveys.

3.3 AQUATIC STUDY METHODS

3.3.1 Introduction

Aquatic biological sampling was performed in accordance with SOPs EE.01, EE.02, EE.03, and EE.04 during the spring and fall seasons of 1991. Physical/chemical water data collected concurrently with aquatic biological samples included conductivity, dissolved oxygen, pH, temperature, and turbidity. In addition to these data and water depth, general water quality indicators (i.e., alkalinity, free and total acidity, total hardness, total suspended solids, and apparent color), nutrients (i.e., nitrogen as nitrate, nitrite, and ammonia; ortho-phosphorus; and sulfate), and total chlorine were measured with a Hach Kit™. These water quality parameters

were measured near the outlets of the impoundments and at the sample location at all other sites. Sample locations are shown on Figure 3.3-1.

3.3.2 Field Methods

Phytoplankton and Periphyton

Sampling of aquatic plants focused specifically on phytoplankton and periphyton; aquatic vascular plants (e.g., cattails) were part of the terrestrial sampling program. The sampling methods differed somewhat between the two sampling programs as outlined in the following discussions.

Phytoplankton samples were collected at each of the stream stations and impoundments in accordance with the SOP EE.03 during the fall (August–September). A sampler with a remote trigger system was used to sample a known volume of water. Sample sites in impoundments were sampled at five different points to allow sampling of a greater habitat profile. One sample was collected at each of the following locations: the deepest point, midway between the deepest point and the inlet, a point midway between the deepest point and the outlet, and two points on either side of the impoundment axis (halfway between the inlet and outlet, and midway between the axis and the shoreline). Samples collected for the OUI EE consisted of one to several grab samples taken at the mid-point of the impoundment or in-stream pool. Water quality parameters were measured near the impoundment outlet.

Periphyton were collected during the fall (August–September). Tiles and diatomers (floating racks holding microscope slides near the water surface for collecting algae and diatoms) were the artificial substrates used in accordance with the SOPs. Tiles were used at all stream sites (Figure 3.3-1); however, they were poorly colonized compared to glass slides (indicating that the tiles may have been contaminated). Floating diatomers were used where water was deep enough (more than 30 cm as specified in the SOP EE.01). All study sites were sampled for periphyton. The water quality parameters listed above were sampled at periphyton sampling sites.

Benthic Macroinvertebrates

Benthic macroinvertebrates were collected in May–June and August–September. Impoundments were sampled using a bottom dredge or core sampler to collect composite samples, in accordance

with the SOP EE.02. Samples were collected at five locations within each impoundment, as described for phytoplankton. At each location, a composite sample with a volume of at least 2,000 cubic centimeters (cm³) (2 liters) was assembled from a minimum of four subsamples. At all stream sites a Surber sampler (0.09 m² opening) was used. Water quality data were collected at each benthic macroinvertebrate sample point.

Fish

All aquatic sites were evaluated for the likelihood that fish were present. Sampling was carried out at places where fish were expected during spring (May–June) and fall (August–September) according to the methods outlined in the SOP EE.04. Minnow traps were set at sites likely to support fish, and trapping was maintained for a minimum of three nights. Depending on results, some locations were trapped for longer periods of time. Gill nets were used in impoundment sites Pond C-1 (SWC1), Pond C-2 (SWC2), and Lindsay Pond (SW05) to sample species not collected by minnow trapping. Electroshocking was used in some areas of Woman Creek to verify the efficiency of other collection methods. Measurements of length, weight, and an estimate of age were recorded for larger fish species during the fall to provide information on the condition of individuals at the end of the period of maximum annual growth. Water quality was recorded at all fish sampling sites.

3.3.3 Data Analyses

Ecological analyses for plankton and periphyton taxa provided information on taxon presence, richness, and relative abundance. Because some members of these groups are not readily identified to the species level, some were listed to the lowest reasonable taxonomic level while others were keyed down to species. Taxa of benthic macroinvertebrates in stream and pond habitats were analyzed for presence, richness, and relative abundance. Benthic macroinvertebrates were identified to the lowest reasonable taxon. Analysis of fish data included determination of species presence, species richness, and species relative abundance.

4.0 RESULTS AND DISCUSSION

4.1 ECOSYSTEM INTERACTIONS

An ecosystem is a dynamic assemblage of organisms. Organisms that are more tolerant to environmental factors are more competitive within the communities, although the ability of both plants and animals to expand their population is controlled by limiting environmental factors (plants—water, light, nutrients; animals—water, food, habitat).

To facilitate understanding of the complex environment at RFP, it was divided into terrestrial and aquatic ecosystems, which have very complex interrelationships and the communities are interdependent. As a result, environmental information on the terrestrial ecosystem in this report complements the aquatic ecosystem sections, and vice versa. Terrestrial ecosystem characteristics (physical, chemical, and biological processes) have a significant impact on the development and continuity of aquatic ecosystems because of the downgradient movement of materials due to gravitational forces. The main routes of movement are surface runoff and wind dispersal, although contaminants are also deposited by atmospheric dryfall or releases from human activities, such as pesticide spraying, industrial discharges and landfills. Terrestrial input of inorganic and organic substances also determines groundwater and surface water quality in the watershed; input of plant litter provides the primary source of energy for headwater streams, which have limited autotrophic productivity.

Descriptions of the terrestrial ecosystem are presented in an increasing moisture gradient. Xeric (dry) zones include plant communities that are characterized by and require only a small amount of moisture. Mesic (moderately dry) zones include plant communities that are characterized by and require a moderate amount of moisture. Hydric (wet) zones include plant communities that are characterized by and require an abundance of moisture. Animals that inhabit plant communities select specific habitats because the communities have the proper balance of water, food, and shelter. Figure 4.1-1 illustrates the relationships of the plant communities at RFP to the soil moisture zones and to each other.

4.2 ECOLOGICAL FOOD WEB

The biological organisms in an ecosystem are associated in an ecological food web of all interacting food chains. Food chains are made up of groups of organisms arranged according to the order of predation, in which each often uses the next lower member as a food source. Plants are at the bottom of the food chain. Each step in the food web constitutes a trophic level. Each trophic level is made up of organisms that occupy specific niches. A niche is the ecological role of an organism in a community, especially in regard to food consumption, although niche can also refer to a habitat supplying the factors (food and water) necessary for the existence of an organism or species.

The three primary niches in the food web are detritivores, primary producers, and consumers. Detritivores are primarily species of bacteria and fungi. Bacteria and fungi degrade complex organic materials, such as dead plants and animals, so that chemically bound elements needed by primary producers for new growth are again available. Primary producers are green plants. Green plants, through photosynthesis, are the only organisms that can use an external energy source, sunlight, to create organic materials from inorganic raw materials. Green plants provide food and habitat for animals and use, for photosynthesis, carbon dioxide that is released when organic materials are degraded. Consumers are animals that primarily eat plants (herbivores), other animals (carnivores), or both (omnivores). The organisms that comprise the food web at RFP are characterized below.

4.3 TERRESTRIAL ECOSYSTEM

The terrestrial and aquatic ecosystem together comprise the hydrologic gradient. Discussion of the aquatic ecosystem follows the hydric zone results in this section.

Productivity of plant communities in the terrestrial ecosystem at RFP is reduced because of the semiarid climate. With an average annual rainfall of 38 cm (15 in) per year, this area is quite dry when compared to the moister parts of the country. Most plant and animal species living in this climate have adapted to drought, temperature extremes, short growing seasons, and other local environmental stresses. Due to the dryness of RFP habitats and its surroundings, the availability of water becomes critical to plant and animal diversity and abundance. The lowest

diversity of all biota is found in the driest (xeric zone) habitats, and the greatest diversity is found in the wettest (hydric zone) habitats. The plant populations in the wet areas at RFP would be the most severely impacted should prolonged drought occur.

4.3.1 Communities

4.3.1.1 Plants

Plants and animals are interdependent. Plants furnish food, cover, and breeding habitat for animals, and in turn, animals may pollinate and spread seeds of plants. Animals also adversely affect plants through physical damage such as trampling or overgrazing when the carrying capacity (productivity) of the habitat is exceeded. A balanced habitat has healthy plant and animal communities.

Terrestrial communities at RFP had 532 species of plants in the Woman Creek, Walnut Creek, and Rock Creek watersheds. These plants belong to four major groups called lichens, bryophytes, vascular cryptogams, and vascular plants which included 25, 16, 4, and 487 species, respectively. A complete list of all plant species documented at RFP is supplied in Appendix B. Not all documented species were encountered using transect sampling methods. Because the vascular plants figure most prominently in the ecosystem, this was the plant group sampled during the baseline study. When separated into groups according to growth-form, trees and shrubs (woody plants) make up seven percent of the total number of species, cactus one percent, graminoids (grasses and grass-like plants) 25 percent, and forbs (broad-leaf herbs) the remaining 67 percent. Table 4.3.1-1 summarizes the growth-form percentages for each community. Figure 4.3-1 shows the proportions of these groups at RFP. Graminoids (grasses) and forbs (broad-leaf annuals) are the two largest groups. Forb species at RFP are almost twice as numerous as grass species. These two groups provide forage for the majority of herbivores, while cactus are seldom eaten. Woody plants provide animal habitat and food for many species especially during winter months.

Descriptions of RFP communities, divided into groups by hydrologic zones, are presented in the following sections. Table 4.3.1-2 presents a summary of the areas and percentages for each mapped community at RFP.

The xeric zone, located on the ridge tops and terraces at RFP, is the area with the lowest soil moisture. The soils which were formed from Rocky Flats Alluvium, are gravelly to rocky, slightly acidic, and have a low water availability for plants. The 91 species of plants growing in this habitat must be tolerant of the mild acidity and require little water. Because of the aspect of these areas, the plants receive full sun for many hours a day and are subject to the drying effect of wind.

The mesic zone, habitats with moderate moisture, provides a less harsh environment for plant growth. Soils here differ from xeric soils due to the structure of the parent rock. Mesic soils are less rocky, mildly alkaline, and have good water availability. This habitat is located on hillsides of the valleys and ravines, which protects it from the drying effects of both sun and wind. During winter, snow remains on north-facing mesic hillsides longer than on xeric areas because less solar heat is available during short winter days. The longer period of snow cover provides greater moisture availability and also lends insulation from extreme temperatures. Because erosion has cut deeply into the bedrock the water table is more accessible to plants in the soils of creek valleys. When saturated bedrock strata have been cut by erosion, seeps create inclusions of hydric soils in the mesic zone. As a result of the increased wetness in the seep habitats, more species (149 species) of plants occur in these microhabitats than in the adjacent mesic habitats; these plants must be tolerant of alkaline soil found in the mesic zone.

The hydric zone is the wettest habitat at RFP. These habitats occur near creek channels, hillside seeps, and springs. The hydric terrace along the bluff on Rock Creek watershed's southern boundary, plus several other hydric habitats along Rock Creek, are created by erosion intercepting the water table. The Woman Creek channel has also cut into the water table, but the seeps in that drainage are usually in the streambed of the tributaries. The headwaters of Walnut Creek's tributaries are farther east than those of Woman Creek, consequently, the channel of Walnut Creek within RFP is not cut as deeply into the fluvial deposit, and groundwater seeps are less common. Soils of the hydric zone are slightly alkaline loamy alluvium with high water availability. The main channels of all three watersheds have areas with permanent pools even during periods of intermittent surface flow. The groundwater seeps keep the hydric habitats moist throughout the year. Many drought-intolerant plants thrive in these habitats. The number

of plant species in the hydric zone (208 species in riparian woodland, which includes the bottomland shrub, and 162 species in marshland) is significantly higher than numbers in the mesic and xeric zones. Figure 4.3-2 shows the percentage composition of plant communities within each hydrologic zone.

4.3.1.2 Animals

Five major taxonomic groups of animals, terrestrial arthropods, amphibians, reptiles, birds, and mammals were characterized at RFP. These groups directly or indirectly depend on the plant communities to provide some portion of their life cycle requirements. In this regard, the diversity of animals is limited by the availability of water, food, shelter, and proper breeding requirements within the existing habitats.

The taxa of animals identified at RFP in 1991 were distributed among 124 families of arthropods, four species of amphibians, eight species of reptiles, 142 species of birds, and 32 species of mammals. The arthropods, particularly the insect herbivores, were the most abundant terrestrial animal group. Cicadellidae, or leafhoppers, are the most frequently observed family of this ecologically important group of plant shredders. Leafhoppers consume large quantities of plant material, and their large numbers create an important prey base for secondary consumers such as birds, small mammals, and predacious insects. These insects provide one link in the food chain that makes energy produced by plants available to secondary consumers.

Another important and abundant arthropod order is the Hymenoptera (ants, wasps, and bees). This order includes the plant pollinators, bees, that often have specific relationships with certain species of flowering plants. Also included in this order are the ants. Colonization activities of ants can defoliate areas around their nests, which exposes barren soil and allows new plant species to invade if the colonies move. For example, aerial photographs covering the area northwest of the firing range show former ant nests, within an area of mesic mixed grassland, that have been invaded by isolated clumps of bunchgrasses.

Passerine birds (songbirds) and small mammals were also abundant animal groups. Most animals in these two group are herbivores or insectivores with a small number of omnivores. They help control the number of insects, spread plant seeds, and serve as a prey base for top carnivores such as raptors and coyotes.

The native grassland communities (xeric mixed grassland and mesic mixed grassland) are occupied by animals adapted to drier habitats with good seed production. Disturbed and reclaimed areas, which exhibit different stages of succession, have animals adapted to those stages or animals that are generalists. The shrublands provide habitat to animals requiring good cover, a variety of plant or animal material in their diets, or seclusion from light (as in the case of nocturnal creatures). The woodland and marsh communities offer moisture, diversity, and usually edge effects where different plant forms such as trees and shrubs meet grasslands. These areas are particularly favored by birds.

4.3.2 Plant and Animal Communities

4.3.2.1 Xeric Zone

Xeric Mixed Grassland Community

Xeric mixed grassland is an extensive community found on the gravelly uplands. This dryland community, which covers 18 percent (Table 4.3.1-2) of the study area, was once damaged by overgrazing. However, many of the native prairie plants have resurged since grazing has stopped. Overgrazing encouraged the establishment of numerous cacti and other opportunistic species. The xeric zone is typified by a mixture of perennial grasses and forbs of varying heights, subshrubs, and cacti. The most frequently observed species are narrow-leaf sedge, blue gramma, and bluestem (big and little), however, mountain muhley and Kentucky bluegrass are also common. Several sage subshrubs, Porter's aster, and trailing fleabane are the most common forbs. With an average density of 80 stems per 100 m² (Table 4.3.2-1), cacti constitute a larger portion of the vegetation than in other communities. Many of the native prairie plants are forbs (broad-leaf annuals), with a few introduced species established as well. Woody plants were represented by Arkansas rose, though it was not common throughout this habitat. Xeric mixed grassland communities contained 21 graminoid species (23 percent), 65 forbs (72 percent), 4 cacti (4 percent), and 1 shrub (1 percent). Table 4.3.2-2 presents a summary of plant species

occurrence by community. Live plants made up 33 percent of the ground cover, with litter covering another 55 percent. Table 4.3.2-3 gives a summary of ground cover percentages by community. The substrate is generally much rockier than in mesic and hydric areas, with gravel and cobbles making up a large part of the ground surface.

The extensive coverage of the xeric zone by forbs and grasses provides good grazing for large herbivores, and supplies an adequate seed crop for birds and small mammals. The grass species and dried basal portions of forbs provide standing hay and fresh forage at the end of the growing season, a valuable food source for herbivores during winter. These are the areas that remain snow free during the majority of the winter season, increasing the availability of forage for large herbivores and improving hunting success for raptors and carnivores. The xeric mixed grassland community is a large contiguous upland community. There are few small isolated units of the community enclosed by other communities. This allows a better intermixing of animal and plant populations in xeric mixed grassland than in the more dissociated communities at RFP.

Arthropods

Terrestrial arthropod taxa (taxonomic groups such as orders or families) in the xeric mixed grasslands community showed the lowest diversity compared to all communities (Table 4.3.2-4). This results from the drier environment found in the xeric zone. The numbers of orders and families in the xeric zone were lower than sitewide community averages for arthropods (Table 4.3.2-5). The most abundant insect families collected were Cicadellidae (leafhoppers 19 percent) and Formicidae (ants, 15 percent). Arachnida (spiders, 12 percent) were also well represented. The two insect families include species specifically adapted to the drier habitats found in the xeric zone. Leafhoppers feed on selective tissue of specific plant species (Borror and White 1970) and, therefore, have specialized relationships with plants found in this community.

Reptiles

The most frequently observed reptiles in the xeric mixed grassland community were prairie rattlesnakes and short horned lizards. Racers were also recorded in this community, and plains garter snakes were reported on roads passing through the xeric zone. Tables 4.3.2-6 and 4.3.2-7

summarize species occurrence by habitat type (grassland includes both mesic and xeric mixed grassland). These species are well adapted to the drier habitats of these native grasslands and are predators of insects and small mammals. No amphibians were observed.

Birds

Passerine Birds (Songbirds)

The most abundant songbirds in this community were meadowlarks and vesper sparrows (Table 4.3.2-8). Vesper sparrows had the largest density per hectare (Tables 4.3.2-9). Table 4.3.2-10 gives bird densities for the entire plant site. Grasshopper sparrows were common but difficult to observe. Both sparrows and meadowlarks are well adapted to the grassland communities and common throughout prairie habitats in the Great Plains. The plumage of these ground nesters provides camouflage among the plant growth. Such cryptic coloration enhances the species reproductive success.

Waterfowl

Waterfowl recorded in xeric mixed grassland communities represented species observed flying over the area. Although mallards, Canada geese, and great blue herons were observed, none of these species was actively using the habitat.

Raptors

Red-tailed hawks were the most abundant raptor in this community, however; turkey vultures, Cooper's hawks, Swainson's hawks, rough-legged hawks, ferruginous hawks, golden eagles, northern harriers, peregrine falcons, prairie falcons, American kestrels and great horned owls were also present (Table 4.3.2-11). These species all use this community as hunting habitat during various seasons. For example, red-tailed hawks were frequently observed carrying snakes. At least two species of snakes, racers and bull snakes, fall prey to these raptors. Deer mice, prairie voles, thirteen-lined ground squirrels, and other small mammals also contribute to the prey base for these avian predators.

Mammals

Small Mammals

Eight small mammal species were found in the xeric grassland community. Deer mice were the most frequently captured small mammal accounting for 74 percent and 79 percent of all species in the spring and fall, respectively. This fact is not surprising since they are found in all regions of the United States and are most common in drier upland habitats (Armstrong 1972). Deer mice are omnivores, and their diet of insects and plant material allows them to adapt to a variety of habitats. The large number of deer mice at RFP creates a substantial prey base for predators such as snakes, coyotes, and raptors. The second most abundant species was the prairie vole. Prairie voles are adapted to the prairie environment and were most common in the xeric grasslands at RFP. Since this vole is active day and night, it is an important prey species for both diurnal (day) and nocturnal (night) predators such as hawks and owls, respectively. The distribution of mammal species by habitat is summarized in Table 4.3.2-12, and species abundance is summarized in Table 4.3.2-13.

Medium-Sized Mammals

The species of lagomorphs (including rabbits and hares) observed at RFP were present in xeric mixed grasslands communities (Table 4.3.2-14). Desert cottontails and white-tailed and black-tailed jackrabbits are adapted to dry habitats where their coloration blends in with the vegetation. Jackrabbits were observed infrequently at RFP, though night surveys might have revealed more of these nocturnal species. The relative abundance of mammals found in the most common habitats at RFP is summarized in Table 4.3.2-15.

Large Mammals

The xeric mixed grasslands communities are used extensively during the rut (breeding season), with large groups of mule deer bucks and does clearly visible throughout the day. Mule deer eat ripe cactus fruits during this season, as evidenced by the autopsy of a buck killed during a rut battle. Xeric mixed grasslands communities are important feeding areas throughout the winter months because they remain snow-free most of that period. Table 4.3.2-16 illustrates the heavy usage of grasslands by mule deer.

Carnivores

Coyotes were the most commonly observed carnivores in the xeric mixed grasslands community (Table 4.3.2-17). Coyotes range across this community as they hunt for small mammals and occasionally deer. Coyotes experience more difficulty in hunting deer during winter because deer gather in large groups that are more capable of defense, and in the open grasslands the coyotes are far more visible than they would be in dense cover.

Ponderosa Pine Woodland Community

The ponderosa pine woodlands community typically occurs on sandstone outcrops as small stands of ponderosa pines, although a few Douglas-firs are intermixed. A good example is the community in the extreme northwest corner of the PPA. Single ponderosa pines occur infrequently on rock outcrops above the Rock Creek bluffs. Undergrowth plants in this community are dominated by native grasses (junegrass, blue gramma, and Canada bluegrass), forbs (pussytoes, spring beauty, and Porter's aster), and shrubs (skunkbrush sumac, and wax currant) that grow interspersed with the trees. With the plant species in this community more typically representing foothills conditions, wildlife not otherwise found in prairie ecosystems is attracted to the area. Although ponderosa pine woodlands community covers only 0.2 percent of the total acreage at RFP, it was surveyed for birds, arthropods, and small mammals to determine the occurrence of species not expected to occur elsewhere. Extensive sampling of the plants in this community was not conducted.

Arthropods

The arthropod community in the ponderosa pine woodlands was not particularly diverse. The numbers of orders, families, and individuals were below the overall average for all other RFP communities (Table 4.3.2-5). Flies (14 percent), ants (13 percent), and crickets (9 percent) were the most abundant families present in ponderosa pine. The ants were specific to the pine trees and to drier sites in general. Flies, similar to house flies, are mostly herbivores and often associated with specific plants found within this community (Borror and White 1970).

Birds

Passerine Birds (Songbirds)

Green-tailed towhees, song sparrows, American robins, and dark-eyed juncos frequent the pines. The towhees and song sparrows are commonly associated with shrubs and this community has a strong shrub component. Robins use the trees only as nesting sites while juncos prefer coniferous forests and shrubland habitats for food, nesting, and shelter.

Mammals

Small Mammals

The mexican woodrat and deer mouse were two small mammal species observed in the ponderosa pine woodlands. Mexican woodrats used the rock outcrops in this community as denning areas. This species was also observed at the clay and gravel pit operated by Jefferson County. Deer mice accounted for 92 percent of all animals trapped (Table 4.3.2-13).

Medium-Sized Mammals

The tell-tale sign of bark stripped from trees was evidence that porcupines occupy this community from time to time. Porcupines often prefer the succulent cambium bark layer of conifers when herbs (the bulk of their summer diet) are not available (Armstrong 1972). Therefore, the limited number of pine trees are an important food source for those individuals over-wintering at RFP. Porcupines can also severely impact a small population of pine trees by girdling and killing trees.

4.3.2.2 Mesic Zone

Mesic Mixed Grassland Community

The mesic mixed grassland community is an extensive community covering 54 percent of the total acreage of RFP (Table 4.3.1-2). This community is located on the moister hillsides and is dominated by western wheatgrass, blue gramma, and Japanese brome. In some areas prairie dropseed replaces Japanese brome in dominance. No forb species clearly outnumbers the others throughout the mesic areas, though composites (members of the Aster family) make up the bulk of the forbs. The high soil moisture is due to slope aspect, wind protection, more snow accumulation, subirrigation by seeps, and general soil characteristics. All these features

contribute to a less harsh habitat than xeric habitat and allow greater species diversity. This diversity was apparent, as 38 species of graminoids, 104 forbs, 5 cacti, and 2 woody plants were observed in the mesic mixed grassland community (Table 4.3.2-2). Ground cover measurement in the mesic mixed grassland community averaged 33 percent live vegetation and 59 percent litter (Table 4.3.2-3).

More diverse cover types occur in a mesic mixed grasslands community than in a xeric mixed grasslands community. The primary reason is because growth of tall grass species encourages use by more bird and mammal species. Most south-facing slopes of the mesic zone shed snow readily, so forage is available there during most of the winter. When the northwest winds blow during the winter, deer and coyotes seek the more protected sunny south-facing hillsides for daytime beds. Also, as a result of the sun increasing ground temperature on south-facing slopes, these areas are among the earliest plant growth locations in the spring. Tall grass species provide a micro-climate and shelter, where the wind is less severe, from the ground upward about 0.5 m (20 in). Reduced wind speed significantly reduces the energy requirement of animals during very cold weather.

Arthropods

Like the xeric mixed grasslands, community diversity values for the arthropods in this community were low also. This was partially due to the limited amount of plant surface available for sweep netting. The available surface area for an insect to inhabit is much less in a grass community than in a shrubland or woodland community. Additionally, drier habitats in the mesic mixed grasslands community had lower species diversity than moister habitats. The leafhopper family had 32 percent of all species of arthropods collected.

Amphibians and Reptiles (Herptiles)

Boreal chorus frog species presence and population estimates were from calls heard in the early spring (Table 4.3.2-18). Ephemeral pools in low-lying mesic mixed grasslands community areas provide breeding habitat for the frogs. These frogs are usually associated with grassy ponds or small pools, but will frequent grasslands presumably to feed on insects (Stebbins 1985).

Woodhouse's toad, an insectivore, also occurs in mesic mixed grasslands community. This toad frequents a variety of habitats in this region but must return to marsh communities to breed.

The three reptile species commonly observed in this community were bull snakes, plains garter snakes, and prairie rattlesnakes. Bull (gopher) snakes were especially common (Table 4.3.2-6). These snakes, which are relatively large for reptilian predators, prey upon a wide variety of primary consumers such as small mammals, young rabbits, birds and their eggs, insects, and occasionally other snakes. Plains garter snakes also frequent the mesic mixed grasslands community possibly while hunting for young small mammals, frogs, worms, and insects. Plains rattlesnakes were often observed in the mesic mixed grasslands community hunting for birds, bird eggs, and small mammals.

Birds

Passerine Birds (Songbirds)

Vesper sparrows, house finches, and meadowlarks were the most abundant songbirds in mesic mixed grasslands. Meadowlarks were observed at a density of approximately one individual per two hectares (5 ac) (Table 4.3.2-19). Vesper sparrow density was about one individual per three hectares (7 ac). Other less commonly observed species such as the savannah and grasshopper sparrows were probably under counted because of their ground-hugging habits. Pine siskins were abundant during late summer, feeding on the seed crop (see Table 4.3.2-8).

Waterfowl

Waterfowl observed flying over this community were mostly mallards, snow geese, sandhill cranes, and Canada geese (Table 4.3.2-20); mallards and Canada geese also used mesic mixed grasslands as nesting cover (Table 4.3.2-21). Figure 4.3-3 shows locations of waterfowl nests. After hatching, the young of both species use grasslands extensively to hunt for arthropods, which comprise the bulk of their diets. Adult geese graze on succulent new grasses in the spring.

Raptors

Red-tailed hawks were common in this community type (Table 4.3.2-11). Turkey vultures, ferruginous hawks, golden eagles, prairie falcons, American kestrels, and great horned owls were

also present. All of these raptors hunt this community extensively for small mammals, small birds, carrion, snakes, grasshoppers, and even medium-sized mammals, depending on the size and ecological niche of the raptor. The sparse cover of grassland habitats allows raptors to more easily locate prey animals.

Gamebirds

Wild turkeys and ring-necked pheasants utilized these grassland communities, but were observed only occasionally (Table 4.3.2-22). A single group of wild turkeys was observed in a mesic mixed grasslands swale adjacent to the ponderosa pine woodlands in the northwest corner of the PPA. Wild turkeys have large home ranges and travel great distances at various times of the year. The regional subspecies, Merriam's turkey, is commonly associated with ponderosa pine and Gambel's oak. Not all turkey habitat requirements are met within the boundaries of RFP. Pheasants are most often associated with agricultural fields but may have invaded from nearby cultivated areas.

Mammals

Small Mammals

The mesic mixed grasslands community had 10 species of small mammals, the highest diversity of small mammals in communities at RFP. Nine species of small mammals were captured during live trapping (Table 4.3.2-13), and specimens of Merriam's shrew were caught in snap traps. These 10 species indicated the greatest diversity among the communities at RFP. Deer mice were the most frequently observed species and meadow voles were also abundant. These omnivores and herbivores are preyed upon by all top predators at RFP. Voles have adapted to heavy predation by developing a polyestrous birth cycle. This means the breeding cycle is repeated more than once during the year. Females born early in the year may give birth their first summer. This tremendous birth rate causes population boom-and-bust cycles. Predators that feed on voles select other prey when voles are not abundant.

Medium-Sized Mammals

Both species of jackrabbits and the desert cottontail (lagomorphs) were recorded in the mesic mixed grasslands community (Tables 4.3.2-14 and 4.3.2-12). Black-tailed prairie dog colonies are established in several mesic mixed grassland areas where they have colonized areas of shorter vegetation. Figure 4.3-4 presents a map of prairie dog towns at RFP. These two groups, prairie dogs and rabbits, comprise an important prey base for large mammalian and avian predators. These species provide greater energy (calories) per capture to the predator.

Large Mammals

Mule deer and white-tailed deer use these native grassland areas as feeding habitat (Tables 4.3.2-12, 4.3.2-15, and 4.3.2-16). Mesic hillsides with their small inclusions of brush patches may provide shelter from the winter winds. The open grassland areas are also used extensively during the rut, and later into the winter months. The openness helps deer spot predators such as coyotes, and with the herd behavior they exhibit at this time of year, they are usually able to take defensive actions.

Carnivores

Coyotes were the most common of the three carnivores found in the mesic mixed grasslands community. Coyotes use this community, where small mammals are abundant, as a hunting ground. Omnivorous raccoons forage in this and many other communities. Although seldom seen, badgers are important in grasslands ecology because of their ability to excavate prairie dog holes to capture prey and make dens that can be used by other animals (Table 4.3.2-17). Coyotes may use abandoned badger dens for rearing pups.

Short Grassland Subcommunity

The short grassland subcommunity covers 1.5 percent of the mesic zone at RFP (Table 4.3.1-2). This community is dominated by native short grasses, predominantly buffalo grass and blue gramma. Junegrass, red threeawn, cheatgrass, cacti, and weedy forbs make up the less abundant species of this community type. This borderline dry-mesic community is used by birds, small mammals, and large mammals less frequently than other grasslands because of sparse cover and lower food availability. Lower moisture and poor soils are responsible for the less productive

growing conditions. The short grassland community is favored by prairie dogs for colonization because of higher predator visibility, due to the low vegetation height, and loose sandy substrate for digging. One prairie dog colony near the northern boundary at RFP used a small area of short grassland and later expanded into the surrounding mesic mixed grasslands community.

Reclaimed Grassland Subcommunity

The reclaimed grassland subcommunity occupies 9 percent of the total acreage at RFP. The subcommunity was probably a mesic mixed grasslands community before the physical disturbances. In fact, they could be expected to return to the native grass mixture of the mesic mixed grasslands after completion of plant succession. Reclaimed areas are artificially produced grassland communities that were planted with pure seed mixtures of one to several grass species, usually smooth brome, a combination of wheat grasses, or blends of both. Because many of the sown species form dense stands, native species have difficulty reinvading. Forbs found in this community type are typically weedy species that colonize disturbed areas. The most common forb in these areas is sweet clover. The process of succession is evidenced by the species diversity found in this community. A number of native grass species contributed to the 25 graminoid species present, though these were represented by few individuals (Table 4.3.2-2). Forbs contributed 50 species, with 2 species each of cacti and shrubs invading (Table 4.3.2-1). This lower diversity of species, particularly the lack of forbs, influences use by birds and small mammals. The reduced food supply attracts fewer animals than in natural communities. Live plant material provided an average of 20 percent of the ground cover; litter accounted for 72 percent (Table 4.3.2-3).

Arthropods

This grassland subcommunity contained the lowest number of total individuals of any habitat sampled at RFP. The low plant diversity did not provide food resources that are preferred by most arthropods. The reclaimed grassland supported 10 orders that included 50 families of arthropods (Table 4.3.2-5). Leafhoppers were the most frequently observed family as they were in many habitats.

Reptiles

Bull snakes and prairie rattlesnakes are common in the reclaimed grassland subcommunity where they hunt for small mammals, birds, and eggs of ground nesting birds (Table 4.3.2-6). However, these snakes are unlikely to be hunting exclusively in the limited areas of the reclaimed grasslands. Reclaimed grasslands are, in most cases, bounded by the native mesic grasslands.

Birds

Passerine Birds (Songbirds)

House finches and meadowlarks were abundant in these grasslands (Table 4.3.2-8), with the density of finches higher than for any other bird species found (Table 4.3.2-23). Finches fed on thistle seeds found in this habitat during the late summer months. House finches were abundant partially because the reclaimed grasslands was near the industrial complex; this species prefers buildings as nest sites.

It is important to note that the reclaimed grasslands were adjacent to large contiguous tracts of mesic mixed grasslands, and were also very close to the riparian woodlands of the Woman Creek drainage. Both of these natural communities were rich in the species found in the reclaimed areas, and the proximity of the reclaimed areas to these richer communities probably contributed to movement of these species between the two communities.

Raptors

Red-tailed hawks were common with turkey vultures, ferruginous hawks, golden eagles, prairie falcons, and American kestrels also using this subcommunity as their hunting grounds (Table 4.3.2-11). The reclaimed grasslands did not provide suitable habitat for nesting or roosting, except where utility towers were present.

Mammals

Small Mammals

A total of five species were captured in traps in this subcommunity. Deer mice were the most frequently observed small mammal (54 percent), but meadow voles comprised over 40 percent of the animals observed (Tables 4.3.2-12 and 4.3.2-13). The only recorded observation of the

Preble's meadow jumping mouse was in reclaimed grassland. The sample site in this reclaimed grassland was immediately adjacent to the edge of the Woman Creek riparian area. Although jumping mice usually inhabit riparian or moist areas with lush vegetation (Lechleitner 1969), this individual was probably foraging for seeds in the smooth brome of the reclaimed area. This subspecies of jumping mouse is discussed in the threatened and endangered species section (Section 4.5).

Medium-Sized Mammals

Although reclaimed grasslands at RFP do not generally have large populations of medium-sized mammals, one reclaimed area does (Table 4.3.2-14). A small, but expanding black-tailed prairie dog colony is established in reclaimed grassland around the radio tower just north of the east access road. These animals take advantage of the freshly worked soil where they find easy digging when burrowing. The mixture of reclamation grasses provides good forage while remaining short enough to allow the prairie dogs to detect predators such as coyotes.

Large Mammals

Mule deer were observed passing through reclaimed grasslands, and occasionally made day beds in these areas.

Tree Plantings

The tree plantings areas comprise shade and ornamental trees planted around office buildings and at the old stage stop (a small apple orchard). Many ornamentals have escaped cultivation and have become established as part of the riparian woodland community (white poplar and siberian elm) or in drier areas (black locust and russian olive). These introduced species provide food, cover, and nesting sites for animals but compete against native plants for available habitats at RFP. Tree plantings were not sampled due to their restricted area (0.02 percent of RFP) and because sampling did include the surrounding plant communities which they inhabited.

Disturbed Areas

Disturbed areas, which occupy 12 percent of the total acreage at RFP (Table 4.3.1-2), include those classified during mapping as annual grass/forb, disturbed/barren land, and developed areas

(structures and roads). These areas are also largely mesic in character, and given time to experience succession, will return to mesic mixed grasslands. Where there is vegetation, the most common species are invading annuals or biennials. Annual sunflower, knapweed, sweet clover, Japanese brome, and cheatgrass are the characteristic species of disturbed areas. Common St. Johns-wort has invaded the area around buildings in the industrial area. Species diversity is low, with graminoids represented by 26, forbs by 49, and woody plants by four species (Table 4.3.2-2). Because most resident plants are annuals or biennials, the cover of living plants turns over annually rather than increasing substantially from year to year through added perennial individuals. This will change, however, as succession progresses with the invasion of perennial species. Ground cover is limited to an average of 16 percent live vegetation and 48 percent litter (Table 4.3.2-3). The poor quality soils of disturbed areas slow successional phases of plant communities. Because topsoil has been removed, less suitable substrate hinders development of native plant communities.

The majority of weedy species that invade disturbed areas is large enough to afford cover for small mammals, desert cottontails, and jackrabbits. Prolific seed production by some annuals provides a seasonal seed source for small birds and mammals. The prairie dog colony near the east gate at RFP probably originated with an invasion into disturbed area before expanding into the surrounding mesic mixed grasslands community. The reduced cover and lower plant height of the annual grass/forb community makes predators in this area highly visible. Grazing by prairie dogs keeps plant growth trimmed down, producing an artificial short grass effect, that allows continued expansion of an established colony. Barren lands are devoid of useful cover or food to support wildlife. Other artificial features, such as transmission lines, buildings, rock piles, borrow pits, and structures in the developed area enhance availability of cover, nesting, and resting sites. Utility poles are frequently used as perches by hunting raptors and most likely contribute to their hunting success.

Arthropods

Eleven taxonomic orders representing 63 families of arthropods were collected in the disturbed areas (Table 4.3.2-5). The most frequently observed family was Acrididae (16 percent), which includes short-horned grasshoppers of the genera *Malanoplus* and *Dissosteira*. A species not

previously recorded in Jefferson County, *Dissosteira carolina* (Capinera and Sechrist 1982), was identified in collections from the disturbed areas. Grasshopper populations vary widely from year to year. These insects prefer disturbed areas and grasslands and feed on the grasses and forbs found there. Grasshoppers are prey species for a number of animal predators including omnivorous small mammals, coyotes, foxes, song birds, and American kestrels. Grasshoppers are an important food source for many juvenile birds, particularly waterfowl and ring-necked pheasant.

Reptiles

Three reptilian species were observed in cover types falling into the disturbed lands category (Table 4.3.2-6). These were western painted turtles and eastern fence lizards that were observed on rock rip-rap, and bull snakes that were observed on roadways. The rip-rap offers warm rocks for sunning and protection from predators for lizards. The warmth of roadways is often attractive to snakes, which have no internal body temperature control mechanism. The lack of plant cover on roads also makes snakes more visible to predators.

Birds

Passerine Birds (Songbirds)

Meadowlarks, house finches, and mourning doves were abundant in disturbed areas (Table 4.3.2-8). The lowest species richness for all seasons occurred in these areas. Meadowlarks accounted for the largest density of all species present (Table 4.3.2-24). Rock wrens, although not abundant, were most frequently observed in this habitat. This species of wren only occurs in rocky areas and was observed only in two other communities, marsh and mesic mixed grasslands (in which disturbed areas are one of the successional stages).

Waterfowl

Observations of waterfowl in disturbed areas were at dam faces, rip-rap, and other man-made structures around marshlands or open water (Table 4.3.2-20). During relative abundance surveys, flocks of waterfowl flying over a particular habitat were recorded in that habitat.

Raptors

A number of raptors frequent these areas for hunting prey because many small and medium-sized mammals live in the disturbed areas. The raptors found in these areas were the sharp-shinned hawk, red-tailed hawk, American kestrel, turkey vulture, great horned owl, rough-legged hawk, and northern harrier (Table 4.3.2-11). Great horned owls used the county gravel pit as nesting and brooding habitat. Table 4.3.2-25 summarizes raptor nesting success for the 1991 season at RFP while Figure 4.3-3 gives the locations of the nesting sites. Great horned owls frequently used the old buildings of the Lindsay Ranch as day roosts, and most hawk species were frequently observed perched on utility poles.

Mammals

Small Mammals

Six species were observed in the disturbed areas (Table 4.3.2-12). Deer mice were the most abundant species (74 percent) in these areas (Table 4.3.2-13). The availability of nesting sites among the rocks and the abundance of food in this community make this an ideal habitat for deer mice. Seed crops and grasshoppers provide plentiful food for the deer mice. Mexican woodrats also use the rock in disturbed areas as nest sites, as they did in the ponderosa pine woodlands. Woodrats benefitted from the same food sources as the mice.

Medium-Sized Mammals

Desert cottontails and black-tailed prairie dogs were the most commonly observed medium-sized mammals in disturbed areas. Cottontails were found in this habitat more frequently than in any others because they prefer the rocky areas (Table 4.3.2-14), and can frequently be found in areas totally devoid of vegetation. Cottontails use cover and denning sites provided by rockpiles, concrete slabs, and brushpiles in disturbed areas. Black-tailed prairie dogs established a colony in the annual grass/forb disturbance type southwest of the east gate. The broken soil offered easier digging for prairie dogs as they established new burrows. The disturbed areas of the clay and gravel pits showed the majority of the jackrabbit tracks when relative abundance transects were run during tracking snow conditions. These lagomorphs were seldom observed in any habitat, however.

Large Mammals

Mule deer used disturbed areas (Tables 4.3.2-12, 4.3.2-15, and 4.3.2-16) considerably less than other habitats available to them. Deer were occasionally seen resting under shady overhangs of the clay and gravel pits, and tracks and sightings showed them to feed and water in these areas. Some pits contained ponded water that was accessible to the deer for drinking.

Carnivores

Four species of carnivores were observed in disturbed areas (Table 4.3.2-17) as they hunted for small mammals and insects. Long-tailed weasels often prefer rocky areas, like rip-rap, in which to hunt small mammals (Armstrong 1972). The weasel's body shape allows it to follow small mammals and ground squirrels into burrows and other tight spaces. Coyotes were observed hunting in disturbed areas, and their tracks in the snow revealed attempts, sometimes successful, to catch cottontails. Tracks in snow or mud also indicated that striped skunks and raccoons foraged in this habitat.

Tall Upland Shrub Community

Scattered thickets of the tall upland shrub community occur on mesic hillsides, particularly north-facing slopes, on lowland stream banks that are above the water table, and in shallow depressions where water periodically collects. This community is dominated by hawthorn, chokecherry, and wild plum, which shade out grass and forb species to a large extent. The plant species diversity is low, with 9 graminoids, 38 forbs, and 1 cactus mixed in with the 9 species of shrubs (Table 4.3.2-2). The average density of woody plants in this community was 136 stems per 100 m² (Table 4.3.2-1). Table 4.3.2-3 summarizes the vegetation cover. At a mere 0.4 percent of the total acreage at RFP, this community might seem unimportant, but these woody plant species provide important cover and food resources otherwise unavailable in a prairie ecosystem. This community provides important fawning grounds for deer; nesting and roosting habitat for owls, magpies, and a number of passerine birds; resting areas for deer and carnivores; perches for raptors; and feeding cover for coyotes.

Arthropods

The diversity of arthropod taxa, both orders and families, was average for the tall upland shrub community when compared to all communities (Tables 4.3.2-4 and 4.3.2-5). The leafhopper family was the most abundant (15 percent), followed by spiders (10 percent). This community has several plant species that are dependent on the bees, wasps, and butterflies for flower pollination. The fruiting shrubs, such as chokecherry, wild plum, and hawthorn, must be pollinated to produce fruit and viable seeds. The reproduction of these species depends on both the pollinators and the species that eat their fruits and scatter seeds.

Amphibians

Amphibians were the least abundant in the shrubland habitats. Only the northern leopard frog was observed in the tall upland shrub community, and this was in areas of seeps where short marsh was immediately adjacent to or included in the tall shrub community (Table 4.3.2-18). Frogs can meet their life cycle requirements in this habitat.

Birds

Passerine Birds (Songbirds)

Meadowlarks, red-winged blackbirds, black-billed magpies, and rufous-sided towhees were abundant species in tall upland shrub (Tables 4.3.2-8 and 4.3.2-26). The abundance of the first two species is a reflection of their overall abundance on the entire RFP site. These species use the community for perches, but are not specifically adapted to the shrubland habitat. Red-winged blackbirds often perched on the brush although they were nesting and feeding in adjacent cattails. Other common species such as rufous-sided towhees and black-billed magpies nest and feed in the tall upland shrub community.

Raptors

Great horned owls had the greatest density of raptors in the tall upland shrub community (Table 4.3.2-11). The owls used this habitat as roosting cover, and hunted the edges of the shrublands where they met the marshlands and grasslands. Short-eared owls were also observed using the tall upland shrub as roosting cover.

Mammals

Small Mammals

A total of three species were observed in the tall upland shrub community. The most abundant small mammal was the deer mouse (58 percent in spring and 73 percent in fall), although meadow voles were also abundant (42 percent) (Table 4.3.2-13). Other species captured were prairie voles and western jumping mice. Many small mammal burrow openings were evident at the bases of the shrubs. A northern pocket gopher was trapped in a tall upland shrub thicket in upper Rock Creek (Table 4.3.2-12).

Medium-Sized Mammals

Signs of porcupines and observations of desert cottontails were recorded in tall upland shrub. Both species occurred in small numbers and use a variety of other communities on RFP (Table 4.3.2-14).

Large Mammals

Mule deer were frequently found bedded in the shelter of tall upland shrubs during cold, windy winter weather (Tables 4.3.2-12 and 4.3.2-16). During cold weather, shelter provided by shrubs can be an important factor in the survival of animals. If the wind chill factor can be reduced, the food requirement to keep the animal warm is also reduced. Deer were often abundant in these communities during mid-day in the spring and summer months because they used the shrubs for shade from extreme heat, for browse, and for fawning. This community meets many of the life cycle requirements for mule deer.

Carnivores

Coyotes were the only carnivore regularly recorded in shrubland habitat (Table 4.3.2-17). Coyotes used this habitat in various ways—as denning areas for rearing pups; as hunting grounds for small mammals and mule deer fawns; and as shelter from the heat and wind. When coyotes were given the windfall of a road-killed deer, they frequently carried fragments of the carcass into the tall shrubs to consume them. Long-tailed weasels were also observed in the tall upland shrub community. These active small predators eat young rabbits and small mammals.

4.3.2.3 Hydric Zone

Riparian Woodland Community

While the riparian woodland community occupies only 0.6 percent of the total acreage at RFP (Table 4.3.1-2), it is one of the most important communities for wildlife. This community provides food, cover, nest sites, shelter, and water for a large variety of wildlife, including woodland birds such as woodpeckers. Many species of passerine birds visit the cottonwoods for seeds and insects. Owls most often roost in cottonwoods, and deer frequently bed in the cool, damp willow thickets during the hottest months. Raptors select the tall cottonwoods as nesting sites. Snakes and several mammalian predators hunt within the riparian woodlands because of the abundance of small mammals. The riparian woodland substantially influences the species diversity and numbers of wildlife at RFP.

Riparian woodlands are long narrow strips that follow the riparian (stream channels) habitat. This characteristic enhances species diversity by providing miles of edge, or transition zone. A habitat composed of a complex combination of closely interwoven woodland/streamside plant associations, riparian woodland cannot be divided into distinct parcels for study. With 208 species of plants represented by 54 graminoids, 135 forbs, 3 cacti, and 16 species of woody plants, this community is the most diverse of those sampled (Table 4.3.2-2). Ground cover was made up of 25 percent live plants and 57 percent litter (Table 4.3.2-3). The average density in the riparian woodland community was 59 stems per 100 m² for woody plants (Table 4.3.2-1). The most prevalent species are cottonwoods and willows (peachleaf and coyote), with an herbaceous undergrowth of shade-tolerant, moisture-tolerant, and marshland plants. Depending on depth of the water table, the same complex may traverse areas of Kentucky bluegrass, cacti, willow, Canada bluegrass, cottonwood, cattails, leadplant, sedges, rushes, and a variety of forbs. In areas having lower streambed water tables, leadplant may replace willow as the most common shrub species.

Arthropods

The riparian woodland complex had the greatest diversity of arthropod taxa (Table 4.3.2-4), and the largest number of families (Table 4.3.2-5). This community complex also produced the largest total number of individuals. The most abundant family was the leafhoppers (43 percent).

Hollows in the rotted heartwood of several large old cottonwoods provided hive sites for honey bee colonies.

Amphibians and Reptiles (Herptiles)

Racers, bull snakes, and plains garter snakes were found in the woodland areas (Tables 4.3.2-6 and 4.3.2-18). Small mammals, birds, bird eggs, and invertebrates, in decreasing order of importance, are abundant in the woodland community, providing a large prey base for these reptilian predators. Because the riparian woodland includes the stream channel of the creek along which the complex is established, snakes also have a prey base in the pools and riffles of the creek. Frogs, toads, tadpoles, minnows, and larval salamanders add to the available food base for predators.

Birds

Passerine Birds (Songbirds)

Vesper sparrows, meadowlarks, red-winged blackbirds, house finches, morning doves, and barn swallows were abundant species in the woodland complex (Table 4.3.2-8). The abundance of the first three species is a reflection of their overall abundance on the entire plant site. The species listed in the spring and summer readily nest in this community, although breeding at RFP was not confirmed for all these species. Each species uses a specific niche for nesting. Some species, such as the northern oriole, are tree nesters, while others, like tree swallows, are cavity nesters. Other species nest in the shrubs or the lush vegetation that are a part of the woodland complex. Species richness in the riparian woodland community of the hydric zone was higher than any of the xeric or mesic communities. Only the marsh community in spring and summer had higher species diversity. House finches were found in the greatest density in the riparian woodlands (Table 4.3.2-27). This was due to large numbers of finches in the Woman Creek Drainage. American goldfinches and song sparrows also had high densities, particularly in the Woman Creek drainage. Seasonal differences were found for white-crowned sparrows, abundant during fall migration, while American tree sparrows were abundant during the winter. Many other passerine species use the woodland community to meet their water requirements, to escape severe weather, or for seasonal food sources.

Waterfowl

Mallards were abundant and great blue herons, black-crowned night-herons, and buffleheads were common in riparian woodland habitats due to the inclusion of open water within the type (Table 4.3.2-20). Herons use large trees as resting perches. Common snipe were occasionally flushed from hiding places within this habitat. The presence of these waterfowl reflects the close association of the two hydric communities, woodland and marsh. Mallards used the short upland (snowberry) shrub subcommunity as nesting cover (Tables 4.3.2-21 and Figure 4.3-3).

Raptors

Red-tailed hawks and great horned owls were common to the riparian woodland complex (Table 4.3.2-8). Both of these species nested in the large cottonwoods of the riparian areas. Table 4.3.2-25 summarizes the observed raptor nesting activity, and Figure 4.3-3 presents the nest locations for the 1991 breeding season. Four great horned owl nests were recorded, three of which successfully fledged young. Four red-tailed hawk nests and one Swainson's hawk nest were observed, but only two red-tailed hawk nests fledged young. The other nests were abandoned without fledging young.

Gamebirds

Ring-necked pheasants, an introduced species, were observed most frequently in riparian woodlands (Table 4.3.2-22). Pheasants utilized the water available and the shelter present in this community. The abundance of insects would also fulfill the needs of juveniles.

Mammals

Small Mammals

Trapping in the riparian woodland community captured four species. Deer mice were the most abundant small mammal (76 percent), while meadow voles accounted for 23 percent of the individuals captured (Table 4.3.2-13). Other species observed were hispid pocket mice and western jumping mice. The woodland community had the largest abundance of small mammals at RFP, making it a good prey source for predators.

Medium-Sized Mammals

Desert cottontails and porcupines were the only medium-sized mammals observed in riparian woodlands (Tables 4.3.2-12, 4.3.2-14, and 4.3.2-15). The succulent vegetation and diversity of undergrowth plants fulfill the dietary requirements of these two herbivorous species.

Large Mammals

Mule deer were frequently observed in this community during mid-day when they used the trees and shrubs as cover from heat or wind (Tables 4.3.2-1 and 4.3.2-12). White-tailed deer were occasionally present. Deer used the shrubs for food and parts of the woodland complex as fawning areas, although not nearly to the degree that they use the upland shrub community. This community meets many of the life cycle requirements of mule deer including water, shelter, food, and birthing areas. Even though elk were not observed at RFP, their droppings were found in this community.

Carnivores

Raccoons, striped skunks, long-tailed weasels, and coyotes were all recorded in the woodland community (Table 4.3.2-17). These species meet their water and food requirements here. Coyotes and weasels exploit the abundance of small mammals. Raccoons and skunks are more omnivorous in their diets and consume native fruits, invertebrates, birds, eggs, and small mammals. The hollow boles of the large old cottonwood trees provide good denning sites for raccoons. Cutbanks along creeks are often used as denning sites by skunks.

Short Upland Shrub Subcommunity

Snowberry and Canada bluegrass are the most common species in this subcommunity. Though there are some large stands of snowberry/Canada bluegrass, they are actually inclusions within the riparian woodland community, and portions of this habitat were included in some of the riparian woodland sample plots.

Bottomland Shrub Subcommunity

The bottomland shrub subcommunity is established in areas with persistently damp substrate adjacent to stream channels, ditches, and ponds where more intermittent stream conditions occur.

The most common species is leadplant, with some shrubby willows intermixed. The low diversity of plant species and damp soils in this subcommunity reduce to some degree use by small mammals and birds, although the shrubs provide nesting habitat and cover. Small mammal use attracts snakes, and the moist shade frequently encourages use of the shrub thickets as summer bedding areas by deer.

Arthropods

Taxon richness was average for terrestrial arthropods (Table 4.3.2-4), as was the number of orders (Table 4.3.2-5). The number of individuals was relatively low indicating a low abundance of arthropods. Leafhoppers were the most frequently observed family accounting for 37 percent of all arthropods collected.

Reptiles

Bull snakes and prairie rattlesnakes were observed in this shrub habitat (Table 4.3.2-6). Since reptiles cannot internally regulate their body temperature they must avoid high temperature by seeking shade like that provided by this habitat. The presence of small mammals and birds provided plentiful prey species for these reptilian predators.

Birds

Passerine Birds (Songbirds)

Vesper sparrows and meadowlarks were common species in bottomland shrub (Table 4.3.2-8). The drier habitat provides less plant diversity than riparian woodland, which results in lower bird diversity. Some small birds do use the shrubland as nesting cover, however. This habitat was used by grassland species escaping the hot afternoon temperatures in summer.

Mammals

Small Mammals

Only deer mice and meadow voles were collected in this subcommunity. More than 77 percent of the individuals collected were deer mice (Table 4.3.2-13). These species were abundant on the entire RFP site.

Marsh Community

The marsh community complex includes wet meadow, short marsh, and tall marsh communities which were too limited in size to be treated separately. Each of these communities was mapped as separate components of the marsh community complex, but as in the riparian woodlands, they were sampled as a unit.

Wet meadow is dominated by prairie cordgrass, sedges, and other moisture-tolerant species. Snowberry may occur in clumps within this community. Short marsh is established in seasonally saturated sites such as intermittent stream drainages, hillside seeps, and outflow areas of springs. These areas are dominated by sedges and rushes, and the lack of diversity and cover reduce the diversity of small birds and mammals using them. Tall marsh occurs in valley bottoms, around impoundments, and in drainages. In areas where there are permanent springs, patches of tall marsh may be established on hillsides. The presence of tall marsh, dominated by cattails, and to a lesser extent, bulrushes, indicates the presence of persistent subsurface or standing water. The marshlands of the SID are representative of wet area succession, and are less diverse than their natural counterparts. The open water of the impoundments and clay and gravel pits were included in the marsh community for sampling purposes.

Marshlands, including open water, represent only three percent of the total area at RFP. As with riparian woodlands, however, the species richness of this community is significantly higher than would be expected based on the area occupied. A total of 57 graminoid species, 100 forbs, and five woody plants were identified in this community (Tables 4.3.2-1, 4.3.2-2, and 4.3.2-3). The tall marsh provides summer cover for deer, food for muskrats, and breeding habitat for several species of birds that would not otherwise be present in a prairie ecosystem.

Arthropods

A total of 1,826 individuals were collected by sweep netting. The most abundant taxa found was the Cicadellidae family, the leafhoppers, comprising 13 percent of all individuals collected. The largest number of arthropod orders on the RFP site was collected in the marsh community. The high overall taxa richness equaled that of the riparian woodland community (Table 4.3.2-4).

Therefore, it is one of the most diverse and productive arthropod habitats. Eighteen orders containing 91 families were identified from captured individuals (Table 4.3.2-5).

Amphibians and Reptiles

This community had the highest diversity of amphibians of all the communities surveyed (Table 4.3.2-18), because amphibians depend on water for much of their life cycle. Tiger salamanders were found exclusively in the marsh community, usually in or near standing water in pools or impoundments.

Four reptilian species were observed in this community (Table 4.3.2-6). The only turtle species found on RFP, the western painted turtle, was abundant in the marsh community. Turtles were found near the shoreline of ponds and stream banks or floating in the ponds. Bull snakes, plains garter snakes, and prairie rattlesnakes were also observed. These predators were feeding on the abundant insect, bird, and small mammal populations and finding shelter from high temperatures during the day.

Birds

Passerine (Songbirds)

The most abundant passerine species in this community is the red-winged blackbird (Table 4.3.2-28). The abundance of meadowlarks and house finches reflects their general abundance at RFP. Red-winged blackbirds nest almost exclusively in the cattail marsh community. The highest diversity (species richness) for passerines in any community type was recorded during spring and summer in marshlands (Table 4.3.2-8). This indicates the importance of this community to breeding birds, because mating and rearing young are the two main activities at this time. The common yellowthroat was another bird specific to tall marsh. It completes its breeding phase within the tall marsh plants, and obtains its food there as well. This was the habitat where marsh wrens also were routinely observed.

Waterfowl

The marsh community had 23 species of waterfowl and shorebirds (Tables 4.3.2-8 and 4.3.2-20). Within this community all of their requirements for food, water, shelter, and breeding habitats are met. Some species of waterfowl may use other communities for nesting cover, however. The most abundant waterfowl species was the mallard. Spotted sandpipers and killdeer were the common shorebirds. Great blue herons and black-crowned night-herons were the common avian predators feeding on fish and aquatic invertebrates. The open water of the impoundments attracted waterfowl during all seasons, with use curtailed only when the ponds were frozen. Migratory flocks stopped to feed and rest in large numbers. Several waterfowl species nested, or were suspected to nest, in the marshlands. Tables 4.3.2-21 and 4.3.2-29 summarize nest records and brood sightings from the 1991 breeding season.

Raptors

Red-tailed hawks were the only raptor commonly observed in marshland areas (Tables 4.3.2-8 and 4.3.2-11), although northern harriers were another species observed hunting in this community. These two predators exploit the abundant prey base found in this community type. Although not observed, owls were suspected of hunting voles along the short marsh because castings often contained bones of voles.

Gamebirds

Ring-necked pheasants were the only gamebird observed in this habitat type (Table 4.3.2-22). Pheasants often use the dense shelter of the cattails to avoid predation and as winter cover. Tall marsh becomes critical to their survival during severe winter storms.

Mammals

Small Mammals

A large number of small mammals distributed among four species were captured in the marsh community. This was the only community where meadow voles were more numerous (52 percent during fall collections) than deer mice (Table 4.3.2-13). Deer mice were the most frequently observed species in the spring. Meadow voles appear to be best adapted to moister environments, whereas deer mice are best suited to drier upland areas (Armstrong 1975). This

fact combined with the abundance of insects and birds demonstrates a strong prey base for predators hunting the marshlands.

Medium-Sized Mammals

Muskrats were the most abundant medium-sized mammal in the marshlands (Tables 4.3.2-14 and 4.3.2-15). These omnivores spend most of their lives in the marsh communities where all their life cycle requirements are met. In autumn, muskrats may leave their waterways in search of new areas to colonize (Armstrong 1975). During this time, they may be available to terrestrial predators, such as coyotes, as a source of food. Muskrats' nocturnal habits protect them from diurnal predators to a large extent. Their normal predators are minks and raccoons, which are semiaquatic in nature.

Large Mammals

Relative abundance surveys revealed that mule deer spent the least time in marshlands (Tables 4.3.2-15 and 4.3.2-16). Deer can meet their water and escape shelter requirements here, although the riparian woodlands and tall upland shrub communities provide the same requirements. Deer use cattail thickets for summer bedding areas, taking advantage of the cool, damp soils and the shade afforded by the tall plants. Early spring growth of plants starts at the margins of ponds and streams, causing deer to congregate in these areas to take advantage of the early sprouting of grasses and forbs.

Carnivores

All the carnivores observed on the plant site used the marsh community at some time. This is not surprising with the abundance of the prey base in these areas. The raccoon is particularly associated with this community due to a diet of invertebrates, amphibians, fish, and the occasional muskrat. Coyotes were frequently observed capturing voles in the short marsh area.

4.3.3 Habitats and Communities within Watersheds

The plant and animal communities just described occupy the three main watersheds contained within the boundaries of RFP. Watersheds are important ecologically because all organisms downstream of the headwaters receive impacts and influences unique to a given watershed. The

physical and topographical characteristics of Woman Creek, Walnut Creek, and Rock Creek differ from each other. Woman and Walnut Creeks, however, are more similar to each other than either is to Rock Creek. Peculiarities of each watershed are discussed in detail below to facilitate the understanding of geographic interactions within plant and animal communities at RFP.

4.3.3.1 Woman Creek Watershed

Habitat Description

The Woman Creek watershed drains the southern portion of RFP (Figure 1.2-2). An elevation change of 152 m (500 ft) occurs over 5 km (3.1 mi) as the stream flows from west to east on the RFP site. The elevation of the main channel varies from 1,874 m (6,140 ft) to 1,722 m (5,650 ft), upstream to downstream on site, respectively. Woman Creek watershed includes two streams: Woman Creek and a more southern tributary that joins the main channel approximately 0.5 km (0.3 mi) upstream of the RFP eastern boundary. The SID and Pond C-2, into which SID flows, are a closed catchment system designed to divert and store runoff from the southern portion of the industrial area. Smart Ditch diverts water from Rocky Flats Lake into a branch of Woman Creek, or, to fill two impoundments, D-1 and D-2, in the southeast corner of the PPA.

Woman Creek is an intermittent stream, fed by groundwater seeps and surface water runoff from side slopes. These groundwater seeps are located mostly in the western portion of the drainage and create large marshland areas, then flow into the riparian zone where the water keeps the vegetation lush. The eastern portion of the drainage is drier than the west and is characterized by dryland vegetation. The four man-made impoundments are also located in the eastern portion of the watershed.

Plant and Animal Communities

The watershed contains eleven of the plant communities and subcommunities described in Section 4.3.1. Percentages of vegetation types and important plant and animal communities and associations are discussed below.

The majority of the Woman Creek watershed is comprised of mesic mixed grassland (55 percent), followed by reclaimed grasslands and xeric mixed grasslands (both 15 percent) (Figure 4.3-5). Disturbed areas, including the industrial area and roadways, comprise 7 percent of the watershed. Marsh is an important community, although represented by only 3 percent of the drainage. Riparian woodlands and bottomland shrubland comprise 1 percent each, while ponderosa pine, short upland shrub, and tree plantings cover less than 1 percent each.

Xeric communities were comprised of two types—xeric mixed grassland and ponderosa pine woodlands. This grassland type is important to snakes, lizards, swallows, various sparrows, raptors, lagomorphs, and mule deer. Heavy mule deer use is seasonal in these areas. During the fall rut and during the winter when other feeding areas are snow covered, mule deer are observed in the greatest numbers. Ponderosa pine woodlands is located in two small areas near the southern boundary of RFP (Figure 3.2-3). These pinelands were not included in the sampling regimen, but can be assumed to be similar in species composition to areas that were sampled.

Mesic communities were comprised of five types—short grass, mesic mixed grassland, reclaimed grassland, disturbed areas, and tree plantings (Figure 4.3-5). An isolated stand of tall upland shrub community occurs as an inclusion in a large parcel of short marsh not far from the ponderosa pine woodland. Woman Creek contained the largest percentage of short grass (85 percent of the total acreage at RFP). Mesic mixed grassland within the drainage accounted for 43 percent of the total. In this community type, the diversity of small mammal and raptor species is greatest. Ground nesting passerine birds and waterfowl used this community as nesting habitat. Other associations of plants and animals were representative of the relationships described in Section 4.3.1. Reclaimed grassland, of which 76 percent is found in this watershed, is a successional stage of mesic mixed grassland. Plant and animal species associated with this community were described earlier. One animal uniquely associated with Woman Creek was the Preble's meadow jumping mouse, which was captured in this community. This mouse was most likely a resident of the riparian area located adjacent to the trap site. Disturbed areas on Woman Creek that included structures of the developed area were habitat for songbirds that often use buildings as nest sites. These species included European starlings, rock doves, barn swallows, house sparrows, and house finches.

Hydric communities were represented by the riparian woodland complex, short upland shrub, bottomland shrub, and marshland complex. All these communities are represented by small percentages of the total watershed area that belie their ecological importance. These areas contain the largest abundance of plant and animal species, and in most cases, the greatest plant and animal diversity in the watershed. The Woman Creek bottomland includes more than half of the riparian woodland and bottomland shrubland found at RFP. Additionally, 42 percent of the marshland complex is in Woman Creek. The marshland contained two species unique to the drainage. These were the northern green orchis, found in the main channel of Woman Creek, and yellow-headed blackbirds. The orchid was recorded in one location only, and blackbirds were found only in the cattails of Pond D-1. Although not an uncommon bird in Colorado, this was the only area it inhabited on RFP. Although breeding was not documented, these birds were in breeding habitat during the breeding season.

4.3.3.2 Walnut Creek Watershed

Habitat Description

Walnut Creek's main channel flows from west to east across the central portion of RFP. The runoff from the northern portion of the industrial area at RFP flows into Walnut Creek and South Walnut Creek. Runoff from the gravel pit just north of the industrial area flows into an unnamed northern tributary. Two other small drainages to the northeast make up the remainder of the area drained by Walnut Creek within the RFP boundary.

Walnut Creek varies in elevation from 1,874 m (6,150 ft) on the west boundary of the PPA, to 1,722 m (5,650 ft) where it exits the northeast corner of the PPA (Figure 2.3-1). The western 2.2 km (1.3 mi) of the uplands slopes very gradually with a drop of only 30 m (100 ft) over that distance. The main channel cuts deeper from that point until the creek reaches the eastern boundary. The remaining 4.8 km (3 mi) of main channel loses 95 m (310 ft) over its length. The hillsides are for the most part fairly gentle.

Walnut Creek contains the majority of the impoundments at RFP. Farthest to the west is the impoundment formed in the county clay and gravel pit (designated as CP3). The four A-series

ponds are in the main channel of Walnut Creek, the B-series ponds are in South Walnut Creek. Just before Walnut Creek leaves RFP there is a small impoundment (designated as SW03).

Plant and Animal Communities

In Walnut Creek the majority of the area (65 percent) is occupied by the mesic mixed grassland community. Disturbed areas that are comprised of the industrial area's buildings, parking areas, and roads cover 20 percent. Reclaimed grasslands (6 percent), xeric mixed grassland (4 percent), and marsh (4 percent) cover most of the remaining area in the watershed. The riparian woodland community contributes 1 percent of the total area while tree plantings, short grassland, short upland shrub, and bottomland shrub combined cover less than 2 percent of the watershed (Figure 4.3-6).

The xeric mixed grassland community was the only xeric zone habitat present in the watershed. Animal species associated with this community were similar to those reported in the Woman Creek watershed.

The mesic zone in Walnut Creek watershed primarily contained the mesic mixed grassland community. Together with reclaimed grassland and disturbed area subcommunities the mesic zone occupied 91 percent of Walnut Creek watershed. The predominant wildlife species in Walnut Creek were, those typical of the mesic mixed grasslands. Mule deer were common and coyotes and raptors were frequently observed hunting in these areas. Wildlife surveys were not conducted within the industrial area, but casual observations indicated the presence of large numbers of rock doves and house sparrows in the disturbed area community.

Hydric communities were represented by the riparian woodland complex, short upland shrub, bottomland shrub, and marsh complex; together they occupied slightly over 5 percent of the watershed. As in the Woman Creek watershed, the riparian woodland community provided nesting cover for diverse songbirds and raptors. Desert cottontails were often observed during relative abundance transects in this community complex, and in the upper part of the watershed near the main channel, ring-necked pheasants were occasionally observed. With the A- and B-Ponds Walnut Creek watershed provides the largest extent of the marsh community complex,

and the greatest area of open water habitat among the three watersheds. Marsh and open water provided breeding and feeding areas for numerous waterfowl. The majority of the waterfowl species recorded at RFP were observed in this watershed.

4.3.3.3 Rock Creek Watershed

Habitat Description

The overall elevation drop from the western boundary to the eastern boundary of RFP is a bit more pronounced than in either of the other watersheds. After passing through the gently sloping uplands to the west, Rock Creek's main channel cuts deeply across the remaining 3.7 km (2.3 mi) of its length on RFP, dropping 156 m (510 ft) in that distance. Rock Creek is characterized by narrower valleys with steeper sides than either Woman Creek or Walnut Creek. The narrower valleys make the upper reaches of the four tributary branches more shady and less susceptible to the gusty winds that blow across the uplands. Blustery west and northwest winds do not reach so deeply into the steep narrow ravines of upper Rock Creek's tributaries as they do in the drainages of Woman and Walnut Creeks. The broader west to east valleys of the other two watercourses catch and channel the strong west and northwest winds. Because Rock Creek flows across RFP from the southwest to the northeast, the west and northwest winds (which are typically the strongest) tend to blow across the narrow ravines rather than being channeled down them.

Rock Creek's wet areas, like Woman Creek's, are fed mostly by groundwater seeps. Only one small impoundment (Lindsay Pond) stays full year-round, limiting the amount of open water to a very small portion of the drainage.

Plant and Animal Communities

Xeric mixed grassland covers the largest portion of the Rock Creek watershed (43 percent), followed closely by mesic mixed grassland (38 percent) (Figure 4.3-7). Disturbed areas, which included portions of two clay and gravel operations, the wind generation facility, and roads were the next largest (11 percent). Marshlands occupy a lower percentage (3 percent) of Rock Creek's drainage because there is much less impounded water than in either Woman or Walnut Creek. Tall upland shrub provides a small but very important amount of habitat (2 percent) in the

drainage. Ponderosa pine woodlands, short upland shrub, and bottomland shrub occupy similar small areas (each 1 percent). Less than one percent is covered by each of the short grassland, reclaimed grassland, and riparian woodland communities. Rock Creek has the greatest number of native communities (9), and thus has the greatest diversity of habitats available among the three watersheds. Plant and animal species characteristic of these communities were described in Section 4.3.1.

The xeric grasslands of Rock Creek have more ponderosa pine woodlands inclusions than similar areas of Woman Creek. These pine lands provide habitat that is unavailable in Walnut Creek. Ponderosa pine woodlands have yielded a few species of forest birds, such as juncos, seldom recorded elsewhere at RFP. Species diversity of both plants and animals in the xeric mixed grassland are otherwise comparable to those of the other drainages. Due to the greater proportion of xeric grassland in Rock Creek, however, the numbers of individuals of these species in this watershed would be expected to be correspondingly higher.

Mesic mixed grasslands make up a smaller percentage of the Rock Creek communities. This reduced acreage carries with it the reduced numbers of individuals of a given species. Species richness of both plants and animals was similar among the mesic grasslands of the three drainages. Reclaimed grasslands in the mesic zone of Rock Creek were not specifically sampled, but typical species numbers and diversity would be expected due to the similarity of the communities. The one disturbed area sampled extensively was divided between Rock Creek and Walnut Creek. No difference was noted between the two contiguous drainages in this area.

Approximately 99 percent of the tall upland shrub community at RFP is found in the mesic zone of the Rock Creek watershed. This feature, along with the steeper ravines of upper Rock Creek, makes the Rock Creek very different from both Woman Creek and Walnut Creek. As described above, the ravine characteristic and the tall upland shrub community combine to provide shelter unavailable in the other drainages. Although Woman Creek and Walnut Creek do have shrublands in the form of bottomland shrub, and the willow thickets that are part of the riparian woodland complex, the character of these shrublands is very different from tall upland shrub. On very windy days, mule deer and coyotes congregate in the tall upland shrub communities of

upper Rock Creek to take advantage of the calmer conditions down in the ravines. The change in wind speed between the exposed uplands and the sheltered ravines on such days can be surprisingly abrupt. The location of the dense growth of tall upland shrub species on the ravine slopes allows the deer the advantage of elevation above the valley bottom when they bed there. This feature may be what influences their choice of the area as a fawning ground. The elevation of the thickets gives a deer the advantage of detecting an approaching predator sooner, and allows it to take evasive measures, or move to a position that is better defended. Does need cover to conceal themselves while in the process of birthing and then to hide their newborn fawns until the fawns can travel. Shrubs of the riparian zone, while they do offer dense cover, do not offer a vantage point from which to detect approaching predators. In fact, it is common for human observers to come very close to bedded deer in the bottomland willow thickets before being detected by the deer. This factor is most likely the reason the majority of does do not select the riparian area for birthing.

The tall upland shrub community affords unique cover to other species as well. The greatest density of great horned owls and rufous-sided towhees were found there. Although great horned owls were not confirmed as nesting in this habitat, they were suspected to have done so. Black-billed magpies were also very dependent on this community for nesting sites and other life cycle requirements. The berries and drupes of fruit-bearing species were important food sources to a variety of bird and mammal species.

Hydric communities of the Rock Creek watershed, comprised of riparian woodland, short upland shrub, bottomland shrub, and marsh, provide approximately 24 percent of those habitats at RFP. These communities contain plant and animal species similar to the other watersheds, except that the western jumping mouse was found in Rock Creek watershed, compared to the Preble's meadow jumping mouse found in Woman Creek watershed. Although Rock Creek watershed has only 7 percent of the total RFP riparian woodland, the large cottonwoods of this community provide important nesting sites for great horned owls and red-tailed hawks. The majority of the hydric zone (approximately 48 ac) is occupied by marsh which is nearly equally divided between short marsh and tall marsh. Lindsay Pond represents approximately 80 percent of the permanent

open water in the Rock Creek watershed, approximately nine percent of the total at RFP. This pond supports small numbers of waterfowl and a healthy population of muskrats.

4.3.3.4 Comparison of Terrestrial Watersheds

The Woman Creek watershed is the largest of the three watersheds at RFP, and as a result contains the largest percentages of most communities mapped and previously described. Walnut Creek has the second largest watershed, and although it is very similar to Woman Creek, it does not hold the same proportions of all communities. Rock Creek, the smallest watershed, is quite different from the other two drainages. Rock Creek's ravine-like valleys are narrow and steep sided, unlike the more open and basin-like valleys of Woman and Walnut Creeks. Walnut and Woman Creeks watersheds hold the majority of open water, with 75 percent in Walnut Creek and 23 percent in Woman Creek.

Each watershed has a larger proportion of at least one ecologically important community. Woman Creek encompasses the largest area of mesic mixed grassland, which is an important community to many prairie adapted birds, to mice and voles, and to the coyotes that hunt these small mammals. Forage production of the grasslands is also very important to mule deer. Although the grasslands are important, the riparian woodlands and marshes of the creek bottoms supply not only several miles of trees, shrubs, and cattails for cover, nesting habitat, food supplies, and water, but also miles of edge habitat. Many mammals and birds use edges between shrublands and grasslands to meet various life cycle needs. Swallows, for instance, may use trees for nesting, but need open areas such as grasslands and open water to meet foraging needs. Deer must have forage from grasslands, cover from shrubs and trees, and water. Great horned owls, while they roost and nest in trees, need short grasses in which to hunt for prey.

Walnut Creek is distinguished by having the majority of the open water, thus attracting most of the waterfowl. There are greater numbers of waterfowl and shore birds that use Walnut Creek's pond system than use those in the other drainages. A second characteristic of this drainage is the very large amount of disturbed area that is occupied by structures. Over half the disturbed area is in the Walnut Creek watershed. The presence of buildings encourages use by several

introduced bird species, such as house sparrows and rock doves. These non-native species were much less plentiful in the native plant communities.

Rock Creek watershed encompasses 99 percent of the tall upland shrub community, and 56 percent of the xeric mixed grasslands. Xeric grasslands are heavily used by mule deer during the late fall and winter months, and thus must be considered as important to their survival. The fall occupation is directly related to their breeding season (the rut), and the winter occupation is due to feeding needs. Tall upland shrub is important to many species, as discussed earlier, but is especially important to mule deer as fawning grounds. This is a critical life cycle requirement for the health of the deer herd. Black-billed magpies are quite dependent on the tall shrub community for nesting habitat, and because they are so often observed in the habitat, it is assumed that many of their other requirements are met there as well.

4.4 AQUATIC ECOSYSTEM

4.4.1 Plant and Animal Communities

Streams, impoundments, and wetlands were the major habitats of the aquatic ecosystem studied at RFP (Section 2.6 gives physical descriptions of streams). These habitats were found to have high species richness, an indication of a healthy ecosystem. Four different groups of organisms were studied: phytoplankton, periphyton, benthic macroinvertebrates, and fish. Each group performs specific functions within the ecosystem.

Phytoplankton (algae) and periphyton (algae and protozoa) are single-celled organisms or chains of individual cells. Phytoplankton are a source of food for herbivores, including larval and adult fish, as well as waterfowl. There were 115 species of phytoplankton collected at RFP. Seventy percent (80 species) were members of the Chrysophyta group, mostly diatoms, which are common in healthy streams. Diatoms also are frequently part of the periphyton communities. There were 121 species of periphyton in the substrate samples. The two divisions with the most species were Chrysophyta with 69 species (57 percent) and Chlorophyta (green algae) with 30 species (25 percent).

Few zooplankton (10 species) were collected because they can swim to avoid the plankton sampling nets used in this study. Among the species collected were *Ceriodaphnia* and two species of *Daphnia*.

Benthic macroinvertebrates, mostly larval stages of insects, are important members of the aquatic community because they have many functional roles. Benthic macroinvertebrates have relatively long life cycles (6 months to 2 years) and are a major food item for fish. Adult stages of aquatic insects are terrestrial. There were 155 taxa of benthic macroinvertebrates collected at RFP. The most abundant orders were Diptera (flies, 76 taxa), Trichoptera (caddis flies, 16 taxa), Coleoptera (beetles, 16 taxa), and Ephemeroptera (mayflies, 11 taxa). Aquatic habitats at RFP have a very high diversity of benthic macroinvertebrates.

Fish species diversity in semiarid climates is naturally low because of the harsh environment and large habitat size requirements of fish. There were nine species collected at RFP. The most abundant family was Cyprinidae (minnow family, 6 species). Most species thrive in the impoundments that offer refuge from annual drought conditions. Several ponds had very high populations of golden shiners and fathead minnows because of abundant algae and benthic macroinvertebrate food sources and the absence of a top predator, like largemouth bass.

The environmental factor most disruptive to aquatic communities at RFP is the natural semiarid conditions. Most streams have sections that are intermittent year-round. Headwater streams, like the three creeks at RFP, frequently have sections without continuous flow except during periods of runoff from snowmelt or after heavy rainfall. Many aquatic organisms present have adapted to low streamflow conditions. For example, organisms such as benthic macroinvertebrates and small fish have been known to survive low flow conditions in stream channels by burrowing into the loose substrate when surface flow ceases. Regardless of the survival mechanisms used by aquatic organisms at RFP to survive in the semiarid climate, the aquatic ecosystem is a healthy and dynamic habitat based on diversity of species and the presence of many taxa known to inhabit clean water. Characteristics of the three watersheds at RFP are discussed below.

4.4.2 Habitats and Communities within Watersheds

4.4.2.1 Woman Creek Watershed

The Woman Creek watershed includes Woman Creek and its headwater tributaries, Smart Ditch, and SID. These three components all flow from west to east (Figure 3.3-1) as discussed in Section 4.3.3.1. Woman Creek, the main stream of the watershed, is characterized by intermittent sections, groundwater seep-fed sections that flow year-round, and impoundments. Intermittent sections are found in both the upper and lower reaches of the creek. These sections have many isolated pools during periods of intermittent flow that are critical for survival of aquatic organisms, especially fish. The only impoundment in Woman Creek proper is Pond C-1 (SWC1) (see Section 2.6). Pond C-2 (SWC2) is located at the end of the SID. Smart Ditch, a man-made diversion, flows southeast to two impoundments, Pond D-1 (SEPN1) and Pond D-2 (SEPN2).

The physical and chemical analyses for the Woman Creek watershed found a pH range of 7.2 to 8.6 in 1991 with adequate dissolved oxygen (5.0 to 13.2 mg/l) for native aquatic organisms (Table 4.4.2-1). Nutrient levels were higher for the fall than the spring sample period because aquatic plants were not incorporating nitrogen and phosphorus chemical compounds into tissue during the fall. Nitrate concentrations ranged from 0.5 to 4.2 mg/l and orthophosphate ranged from 0.36 to 5.0 mg/l which are background levels in the watershed.

Aquatic environments in the Woman Creek watershed provide good habitat for taxa adaptable to low flow conditions because of favorable water chemistry and diverse substrate sizes in the stream channels. The nutrient concentrations in Woman Creek watershed led to high densities of primary producers like algae and periphyton in the ponds and streams.

Phytoplankton and periphyton sampling in the Woman Creek watershed produced 113 species of algae and protozoa (Table 4.4.2-2 and 4.4.2-3). Of these, 68 were Chrysophyta species (diatoms and golden-brown algae; 60 percent), 27 were Chlorophyta species (green algae; 24 percent), and 14 were Cyanophyta species (blue-green algae; 12 percent). Cyanophyta accounted for the highest densities of all algal groups found in the Woman Creek watershed, with *Aphanocapsa delicatissima* and *Chroococcus* sp. the most common species.

Benthic macroinvertebrate sampling in the Woman Creek watershed produced 131 taxa. Diptera, an order of flies and midges with aquatic larval stages, had greater species richness (53 species in spring and 46 species in fall) than any other benthic macroinvertebrate group in Woman Creek (Tables 4.4.2-4 and 4.4.2-5).

Among aquatic fauna, the physical environment of the RFP streams affected fish the most because they have few adaptations that allow them to survive the intermittent flow conditions. Seven species of fish were found within the Woman Creek watershed during the 1991 survey (Table 4.4.2-6). The minnow family, Cyprinidae, had the most species (4) and highest densities of individuals.

Woman Creek, Tributaries, and Ditches

Numerous taxa of phytoplankton, periphyton, and benthic macroinvertebrates inhabited Woman Creek and its tributaries and ditches. There were a total of 57 species present in the phytoplankton samples of Woman Creek exclusive of SID and isolated ponds (Table 4.4.2-2). The most frequently collected taxa were diatoms and golden-brown algae with 43 species (75 percent) and green algae with 6 species (11 percent). A diverse group of benthic macroinvertebrates was present in Woman Creek with seven major groups including crayfish, aquatic insects, leeches, aquatic worms, clams, snails, and planaria. Benthic macroinvertebrate samples were collected during two seasons, spring and fall. Spring benthic samples contained 84 taxa of benthic macroinvertebrates and fall samples contained 81 taxa (Tables 4.4.2-4 and 4.4.2-5). Fish sampling produced seven species of fish, with golden shiners, white suckers, and green sunfish most often collected, in decreasing order of abundance (Table 4.4.2-6). Pond C-1 (SWC1) had the highest fish abundance of any habitat at RFP during the 1991 survey.

South Interceptor Ditch (SID)

There were 37 species of phytoplankton and 60 taxa of periphyton present in the samples (Tables 4.4.2-2 and 4.4.2-3, respectively). The most frequently observed species of phytoplankton were diatoms and golden-brown algae with 28 species (76 percent) and green algae with five species (13 percent); samples of periphyton had similar ranking of species. Benthic macroinvertebrate samples were collected during two seasons—spring and fall. Spring benthic samples contained

43 taxa of benthic macroinvertebrates, and fall samples contained 18 taxa (Tables 4.4.2-4 and 4.4.2-5). Only fathead minnows were found in the SID.

Isolated Ponds

Isolated ponds were those bodies of water not in the channel of Woman Creek or the tributaries. This included the Raw Water Storage Pond and D-1 (SEPN1) on Smart Ditch. There were a total of 42 species present in the phytoplankton samples (Table 4.4.2-2). The most frequently observed species were diatoms and golden-brown algae with 20 species (48 percent), green algae with 15 species (36 percent), and blue-green algae with seven species (17 percent). Periphyton sampling resulted in a total of 57 taxa with similar species composition as those for phytoplankton (Table 4.4.2-3). Benthic macroinvertebrate samples were collected during two seasons, with spring benthic samples containing six taxa of benthic macroinvertebrates and fall samples containing four taxa (Tables 4.4.2-4 and 4.4.2-5). Fathead minnows were found in abundance only at pond D-1 (SEPN1) (Table 4.4.2-6). No fish sampling occurred in the Raw Water Storage Pond.

4.4.2.2 Walnut Creek Watershed

The Walnut Creek watershed contains four surface streams and include twelve impoundments. The four surface water systems are Walnut Creek, South Walnut Creek, and two unnamed tributaries, one of which drains the area below the landfill. The Upper Church and McKay ditches are man-made diversions which route water through the PPA for irrigation purposes. Walnut Creek is the main channel of the watershed and includes the county clay and gravel pit pond (CP3), the A-series ponds, and the lower intermittent portion of the creek. South Walnut Creek contains the B-series ponds. Aquatic habitat is limited in both the A and B-series ponds by operation of the retention system. Yet, these ponds are part of a water treatment facility and need to be drained or rerouted periodically.

The physical and chemical analyses for Walnut Creek watershed found a pH range of 7.5 to 9.0 in fall with good dissolved oxygen (above 7.0 mg/l) for protection of aquatic life (Table 4.4.2-1). Nutrient levels were 0.6 to 5.2 mg/l for nitrate and 0.12 to 0.85 mg/l for orthophosphate which

may be at background levels. Water quality samples were not collected from Walnut Creek watershed in spring.

Major surface streams in Walnut Creek watershed have been modified with two series of retention ponds. These ponds provide retention and treatment of water running off the industrial complex. These impoundments provide habitat for plants and animals adapted to the water level fluctuations. Aquatic organisms also provide water treatment functions.

There were 104 species of algae in periphyton and phytoplankton samples taken from the Walnut Creek watershed (Tables 4.4.2-7 and 4.4.2-8). Of these, 64 species (62 percent) were Chrysophyta (diatoms and golden-brown algae), 21 species (20 percent) were Cyanophyta (blue-green algae), and 14 species (14 percent) were Chlorophyta (green algae).

Benthic macroinvertebrate samples from Walnut Creek contained 16 and 59 taxa of benthic macroinvertebrates for spring and fall, respectively. Diptera had the highest species richness with 10 and 24 species for spring and fall, respectively (Tables 4.4.2-9 and 4.4.2-10).

Three species of fish were collected from Walnut Creek during the 1991 survey (Table 4.4.2-6). Fathead minnows were the most abundant species in collections. Predator fish, like largemouth bass, that feed on other fish, were not found in the samples. One other notable species was goldfish, an introduced species, observed in the clay pit (CP3) pond. Schools of 20 to 30 individuals were observed on numerous occasions.

Walnut Creek, Tributaries, and Ditches

There were 42 species present in the phytoplankton samples (Table 4.4.2-7). The most frequently observed species were diatoms and golden-brown algae with 29 species (69 percent), blue-green algae and green algae each with five species (12 percent). Sixty-four species of periphyton were collected (Table 4.4.2-8). The most frequently observed species were diatoms and golden-brown algae with 36 species (56 percent), green algae with 14 species (22 percent), and blue-green algae with 10 species (16 percent). Benthic macroinvertebrate samples collected in spring and fall

contained 16 and 59 taxa, respectively (Tables 4.4.2-9 and 4.4.2-10). Aquatic worms and Diptera were the two most abundant taxa.

Isolated Ponds

The only isolated pond in the Walnut Creek watershed was CP3, a clay pit. No periphyton sampling was conducted and benthic macroinvertebrates were only collected in fall. A total of 10 species were present in the phytoplankton samples (Table 4.4.2-7). The most frequent species in samples were diatoms and golden-brown algae with 4 species (40 percent), and green algae and blue-green algae each with 3 species (30 percent). Benthic macroinvertebrate samples contained five taxa (Table 4.4.2-10).

4.4.2.3 Rock Creek Watershed

The Rock Creek watershed is best characterized as an intermittent stream fed mainly by numerous groundwater seeps. It flows southwest to northeast. The main channel has five tributaries entering; four at the southwest portion of the watershed and one to the north. The groundwater seeps create many small pools that are present year round. These small pools are critical habitat for aquatic plants and animals adapted to the semiarid environment. Three impoundments are also present in the Rock Creek drainage, two on the southern most tributary, and one (SW108) 0.15 mi from the northern RFP border. Only one, Lindsay Pond, maintains full pool throughout the year; therefore, the amount of open water in the watershed is limited.

The physical and chemical analyses for the Rock Creek drainage ranged for pH from 7.0 to 9.0 and for dissolved oxygen from 8.2 to 13.2 mg/l, which is indicative of good water quality (Table 4.4.2-1). Nutrient levels were 0.5 to 1.5 mg/l for nitrate and 0.42 to 4.1 mg/l for orthophosphate; these are abundant but natural concentrations of these nutrients based on availability in the soils and decomposing plant material.

As with Woman Creek watershed, similar conditions of intermittent flows that affect species exist in Rock Creek watershed. There were 102 species of algae collected in periphyton and phytoplankton samples (Tables 4.4.2-11 and 4.4.2-12). Of these, there were 67 species

(66 percent) of Chrysophyta (diatoms and golden brown algae), 16 species (16 percent) of Cyanophyta (blue-green algae), and 14 species (14 percent) of Chlorophyta (green algae).

Benthic macroinvertebrate samples from Rock Creek contained 53 and 59 taxa for spring and fall, respectively. Three species of fish were collected from Rock Creek during the 1991 survey (Table 4.4.2-6). Few fathead minnows were found in the stream segments of Rock Creek. Lindsay Pond in Rock Creek had diverse fish populations with largemouth bass and white suckers being most abundant.

Rock Creek and Tributaries

Phytoplankton and periphyton sampling results were the similar to the general Rock Creek watershed summary in the previous section. Benthic samples from Rock Creek contained 52 and 59 taxa in spring and fall, respectively. A diverse and healthy aquatic ecosystem exists in Rock Creek and its tributaries.

Isolated Ponds

Only benthic macroinvertebrates were collected during spring in CP1, the only isolated pond on the Rock Creek watershed. Thirteen taxa were collected; Amphipoda, Gastropoda, and Diptera were the most abundant taxa (Tables 4.4.2-13 and 4.4.2-14).

4.4.2.4 Comparison of Aquatic Watersheds

Seasonal fluctuations in the availability of surface water throughout the year would equally affect the populations and species of organisms in the Woman Creek, Walnut Creek, and Rock Creek watersheds (see Section 4.3.6 for related comparison of terrestrial watershed). Only two sample periods (late spring and early fall) were used to characterize the aquatic habitats. Therefore, although detailed comparisons of the aquatic communities are not possible, good biological diversity was confirmed. Some components of the ecosystem were consistent among the three watersheds. For example, water quality did not show great differences between the watersheds but did vary between pond and stream habitats. The most notable feature of water quality was the high background nutrient levels for nitrogen and phosphorus chemical forms, especially in the fall. Two reasons for higher concentrations in the fall are (1) plants that had incorporated

the nutrients in living tissue began to degrade at the end of the growing season, and (2) nutrients available in surface water were not being removed as quickly by growing plants.

Woman Creek watershed, with 37 ha (91 ac) of marshland habitat, had the largest quantity of good quality aquatic habitat at RFP and the highest taxa diversity of the three watersheds at RFP for phytoplankton (83 species), periphyton (94 species), benthic macroinvertebrates (111 taxa), and fish (7 species). The reasons for the higher diversity of all plant and animal groups sampled may result from a larger number of different habitat types (ponds, irrigation ditches, water collection systems) present in this drainage coupled with good water quality.

Walnut Creek watershed, with 31 ha (77 ac) of marshland habitat, had the second largest quantity of aquatic habitat and the most open water. However, health and safety considerations initially limited collections and the number of different taxa collected may be underestimated. Walnut Creek had similar diversity, however, to the Rock Creek watersheds for periphyton (44 species), phytoplankton (44 species), benthic macroinvertebrates (59 taxa), and fish (3 species). The A- and B-series ponds on Walnut Creek have created a large amount of pond habitat in the watershed. Because pond habitats are more stable these habitats differ less (similar current velocities, substrates, etc.) than stream habitats and thus show less diversity among taxa.

Rock Creek watershed, with 19 ha (48 acres) of marsh habitat, had the least aquatic habitat of the three drainages at RFP. The number of different taxa collected may underestimate the actual diversity of plant and animal groups because of fewer samples being taken from this drainage than from Woman Creek. Only one impoundment exists in Rock Creek, Lindsay Pond. Therefore, aquatic habitat in this stream channel was more susceptible to intermittent flow than Woman Creek and Walnut Creeks with their multiple ponds. Rock Creek had the second highest diversity of phytoplankton (79 species), but had similar diversity of periphyton (63 species), benthic macroinvertebrates (59 taxa), and fish (3 species) to Walnut Creek. Rock Creek's diverse terrestrial habitats, plant and animal communities, and reduced human activity, result in more undisturbed natural habitat than the other two watersheds at RFP.

4.5 THREATENED AND ENDANGERED SPECIES

Species of concern are rare plant and animal species that have been listed as endangered or threatened, or are candidates for listing under provisions of the Federal Endangered Species Act (1973, as amended), or are designated in the Colorado list as State Species of Special Concern. State and Federal regulations protect both the populations and critical habitats of these species. The U.S. Fish and Wildlife Service (USFWS) manages the Federal program. It should be noted that not all state listed species are included on the Federal threatened and endangered species list. Federally listed species are rare across their entire ranges. State listing of a species may only be an artifact of political (state) boundaries. For example, the rarity of a species in Colorado may be due to limited habitat, while in states of more optimum habitat, the species is quite common. The species that are present, or have potential habitat at RFP, are listed in Table 4.5.1-1, as adapted from draft Environmental Management Document (EMD) Manuals 5-21000-OPS-FO.21 (DOE 1991a) and 3-21000-ADM-NEPA.12 (DOE 1991b). These manuals present specific physical descriptions and habitat requirements for each listed species. Species of concern found during the field surveys are identified and discussed in detail below.

4.5.1 Plant Species of Concern (Flora)

The potential for rare plant species to occur on the RFP site is determined by their distributions and habitat requirements. Five plant species of concern have the potential to occur at RFP including one Federally listed threatened plant species, Plateau (a.k.a. diluvium and Ute's) lady's tresses (*Spiranthes diluvialis*); two federal candidate species, Colorado butterfly plant (*Gaura neomexicana* var. *coloradensis*) and Bell's twinpod (*Physaria bellii*); and two Colorado Species of Concern assigned the status of Colorado 3 (CO-3), Gay-feather (*Liatris lugulistylis*) and toothcup (*Rotala ramosior*). None of these species was discovered at RFP during specific searches nor during routine plant community sampling.

One Colorado Species of Special Concern, forktip threeawn (*Aristida basiramea*), was found. Further information regarding these species is provided in treatises, lists of plants, and reports for the area, including data compiled by the Colorado Natural Areas Program and the Colorado Native Plant Society.

4.5.1.1 Forktip Threeawn

Forktip threeawn, a member of the Grass Family (Poaceae), is limited to a few sites on sandstone outcrops and disturbed areas in the lower foothills of the Front Range (Weber 1990). This species is one of two annuals in the genus *Aristida*. Forktip threeawn grows to a height of 50 cm (20 in) and has a central awn that is loosely coiled at the base. A small population of this species was observed in a sandy disturbed site along the railroad tracks southwest of the industrial area; this is the same location reported by Weber et al. in 1974. Although forktip threeawn is rare in Colorado, it occurs more commonly in surrounding states. Because it grows in isolated populations in Colorado, this species carries the CO-3 designation for a Species of Special Concern.

4.5.2 Animal Species of Concern (Fauna)

As with plants, the potential for rare animal species to occur on the RFP site is also determined by their known distributions and habitat requirements. Two federally listed endangered species have been sighted at RFP: peregrine falcon (*Falco peregrinus*) and bald eagle (*Haliaeetus leucocephalus*). Federally listed Category 2 species that occur at RFP are the ferruginous hawk (*Buteo regalis*), the loggerhead shrike (*Lanius ludovicianus*), and the Preble's meadow jumping mouse (*Zapus hudsonius preblei*). Further information was obtained from museum records and reports for the area, including data compiled by the Colorado Division of Wildlife.

4.5.2.1 Bald Eagle

Bald eagles, members of the Eagle and Hawk Family (*Accipitridae*), are on the Federal list as endangered. Bald eagles are easily recognized by their large size (wing span up to 2.4 m [8 ft]) and dark plumage set off by the white head and tail in adult birds. Immature bald eagles are easily confused with immature golden eagles because both have dark plumage with mottled patches of white. Bald eagles do not develop the distinctive white head and tail until their second year. This species occurs at RFP as irregular visitors during the winter, or as migrants during the spring and fall. Bald eagles have been observed soaring over the industrial area and flying low over the Rock Creek drainage. None has been observed to roost or actively pursue prey on RFP, though individuals have been observed perching on utility poles in the northeast corner of the buffer zone.

4.5.2.2 Peregrine Falcon

Peregrine falcons, members of the Falcon Family (*Falconidae*), are on the Federal list as endangered. As with other falcons, the peregrine is recognized by its long pointed wings, slim body, and fast pigeon-like flight. Adults are crow size with a wing span of 2.1 m (3.5 ft), light below, and slaty-gray across the back. Peregrines can be distinguished from the similar prairie falcon by their distinct dark helmet, darker color and lack of dark axillary patches under their wings.

Peregrine falcons occur as migrants at RFP but have not been observed during the breeding season. Two individuals of this species were observed in early fall 1991. One was flying from west to east near the west gate. The other was observed perched on a powerline near Pond B-5 and made an attempt to capture a killdeer. The USFWS Peregrine Falcon Recovery Plan discourages land use practices and development that may adversely affect the character of the habitat or prey base within a 16-km (9.9-mi) radius of a nesting cliff. Because there are two potential nesting cliffs within 11-km (6.8-mi) of RFP, the entire site is within the area of potential foraging habitat. Although no nesting activities have been observed at RFP, a pair was reported as nesting approximately 10-km (6.2-mi) to the northwest of RFP in 1991. It is possible that the hunting territory of the nesting peregrines included RFP.

4.5.2.3 Ferruginous Hawk

Ferruginous hawks, members of the Eagle and Hawk Family (*Accipitridae*), are Federal Category 2 candidate species. This category includes species for which there are concerns about the viability of current populations, but for which there is presently insufficient evidence to support listing. Ferruginous hawks are large with wing spans of 2.8 m (4.7 ft), white beneath, and display rufous plumage on its back, legs, and tail. The tail has a white base that is easily seen against the dark feathers of the back.

Ferruginous hawks were observed adjacent to the industrial area in winter, spring, and early summer 1990–1991. Although nesting was not documented at RFP, a juvenile male was resident in the vicinity for a 6-week period in late spring and early summer 1991. This individual was observed hunting primarily in the riparian zone of Woman Creek and along the 881 Hillside,

directly south of the industrial area. Most observations of this species have been near prairie dog colonies southeast and northeast of RFP. Nests of this plains species are built on cliffs or in large trees.

4.5.2.4 Loggerhead Shrike

Loggerhead shrikes, of the Shrike Family (*Laniidae*), are distinctively marked gray, black, and white birds that are about 25 cm (10 in) in length. The black mask and white wing patches are distinctive field identification marks. This predatory bird is on the Federal list as Category 2 because of declining numbers. Loggerhead shrikes were observed occasionally throughout the year.

4.5.2.5 Preble's Meadow Jumping Mouse

Preble's meadow jumping mouse, a member of the Jumping Mouse Family (*Zapodidae*), is on the Federal list as a Category 2 subspecies. The Preble's meadow jumping mouse is a small mouse of about 85 mm (3.5 in) body length and a disproportionately long tail of 147 mm (5.8 in). The pelage is olive yellow on the back and white underneath with no dark dividing band. Several Preble's meadow jumping mice have been captured near Woman Creek.

No aquatic species of special concern were identified as having potential habitat at RFP. Potential habitat is available at RFP for other federal and state listed terrestrial species (refer to Table 4.5.1-1). However, none of these species was observed or is suspected to occur at RFP.

5.0 SUMMARY

The plant and animal communities in Woman Creek, Walnut Creek, and Rock Creek watersheds were characterized at RFP during field studies in 1991 through early 1992. Terrestrial plant (including emergent wetland vascular plants) and animal taxa numbered 532 and 300, respectively. Aquatic plant species (non-vascular only) and animal taxa numbered 236 and 164, respectively. The actual number of taxa at RFP is higher than reported because some organisms, like fungi, submersed wetland plants, and non-arthropod invertebrates were not collected.

The most important factor affecting species diversity in communities is the amount of moisture available (xeric zone - dry; mesic zone - moderate moisture; and hydric zone - wet) to support plant growth, the primary producers in the food chain. Based on plant species known to grow in the habitats (Table 3.2.1-1), six plant communities were determined to exist among the three hydrologic gradient zones at RFP (Table 5.1-1). The total amount, by plant cover types, in all zones at RFP is as follows: grasslands cover 82.3 percent (2,183 ha; 5,393 ac); disturbed areas like the industrial complex and clay pits that were formerly grasslands cover 12.0 percent (318 ha; 785 ac); shrublands cover 1.6 percent (43 ha; 107 ac); woodlands cover 0.7 percent (20 ha; 49 ac); and marshlands cover 3.3 percent (88 ha; 216 ac). The ecological importance of these cover types at RFP is not necessarily proportional to areal extent. For example, one of the most important cover types for wildlife is the riparian woodlands that provide only 0.5 percent (13.5 ha; 33 ac) of the habitat area at RFP. Animals that inhabit plant communities were shown to select certain habitats because of the plant communities provided a source of water, and proper food and shelter.

The xeric zone, located on hilltops, occurs on 18 percent (481 ha; 1,189 ac) of RFP and contains 91 species of plants. Two plant communities were found in this zone, xeric mixed grasslands and ponderosa pine woodlands. Most of the xeric mixed grasslands occurs in Rock Creek (56 percent) and Woman Creek (36 percent) watersheds (Table 5.1-1). Ponderosa pine woodlands only occur in watersheds of Rock Creek (79 percent) and Woman Creek (21 percent). Large mammals, like mule deer, use this zone for breeding grounds in the fall and winter foraging areas. Forage is available here in the winter because wind displaces and solar heat melts the snow cover to expose this habitat before other habitats at RFP.

The mesic zone, located on hillsides, occurs on 77 percent (2,038 ha; 5,033 ac) of RFP and contains 149 species of plants. Two plant communities are found in this zone, mesic mixed grasslands and tall upland shrub. Mesic mixed grasslands occur primarily in Woman Creek (43 percent) and Walnut Creek (40 percent) watersheds (Table 5.1-1). Short grassland, reclaimed grassland and disturbed areas are three subcommunities of the mesic mixed grasslands. Prairie dog towns were found in the short grassland subcommunity; 85 percent of this habitat is in Woman Creek watershed. Mesic mixed grasslands habitat is important for mule deer and

gamebirds, as well as small mammal species at RFP. The highest number of small mammal species was found in this area. The abundant small mammal food supply attracts predators like raptors and coyotes, and deer fed in the mesic grasslands communities. Almost all of the tall upland shrub community, 99 percent (11 ha; 27 ac), was located in Rock Creek watershed. This habitat provides an important mule deer birthing area and nesting habitat for owls, magpies, and shrubland songbirds.

The hydric zone, located on valley floors and near stream channels, occurs on 5 percent (133 ha; 329 ac) of RFP. This very diverse plant habitat contained 208 species in the riparian woodlands community and 162 species in the marsh community, a complex consisting of wet meadows, rushes, cattails, and open water. Seventy percent of the riparian woodlands community occurs in Woman Creek watershed. This community is used for nesting by the highest diversity of songbirds. The marsh community provides habitat for 3 percent (88 ha; 216 ac) of RFP. Open water occurs primarily as the result of irrigation ditching and construction of impoundments. The habitat was distributed in all three watersheds, with most (42 percent) occurring in Woman Creek (Table 5.1-1). The marsh community provides habitat that attracts waterfowl, and, along with riparian woodlands community, is the location of most observations of snakes, skunks, and raccoons that are attracted by food availability. This community is an important nesting habitat for red-wing blackbirds, marsh wrens and common yellowthroats. Mule deer frequently use the habitat for feeding during the early spring and bedding during hot periods of the summer.

There are several unique characteristics for each of the watersheds at RFP. Woman Creek watershed, the southernmost watershed, has the largest drainage area within RFP (1,144 ha; 2,826 ac). The xeric zone (15%) and hydric zone (5%) are minor components of the overall habitats in Woman Creek watershed. The mesic zone contains 79% of all habitats within Woman Creek watershed; the predominant plant community is mesic mixed grassland (55%). The short grass subcommunity provided only 3% of the vegetated area within Woman Creek watershed and 86% of that community type at RFP. The largest area of the marshland complex (37 ha; 91 ac) occurs in Woman Creek watershed.

Walnut Creek watershed, the centrally located watershed at RFP, is the second largest watershed within RFP (878 ha; 2168 ac). The western boundary of RFP is near the upper drainage boundary for Walnut Creek. The xeric zone (4%) and hydric zone (5%) had small areal contributions in Walnut Creek watershed while the mesic zone accounted for 92% of all vegetation communities. Sixty-six percent of the mesic zone was mesic mixed grassland. Also in the mesic zone is the largest disturbed area (173 ha; 427 ac) of watersheds at RFP, the industrial complex footprint. The disturbed area includes roadways, buildings, parking lots, and storage yards; some wildlife, like passerine birds that use buildings for nesting sites, benefit from the disturbed areas.

Rock Creek watershed, the northwestern watershed, has the most diverse topographic relief and the smallest areal extent (629 ha; 1554 ac) within RFP. The xeric zone, primarily xeric mixed grassland, accounts for 43% of the plant community area within Rock Creek watershed and 57% of all xeric habitats at RFP. The xeric mixed grassland is important for survival of mule deer during the fall and winter months. The largest vegetated area (52%) is within the mesic zone (325 ha; 803 ac). Mesic mixed grassland is the most abundant vegetation type (38%). Rock Creek watershed holds 99% of the tall upland shrub communities; providing high quality habitat for rearing of young wildlife.

Several rare species that are protected by the Federal Endangered Species Act or that are on the List of Colorado Species of Special Concern may occur in the vicinity of RFP. Forktip threeawn, a Colorado listed species, was the only rare plant found at RFP. Two Federally listed endangered animal species were sighted at RFP, although these species were not considered to be residents, i.e., to roost or nest there. These endangered species were peregrine falcon and bald eagle. Federal candidate species observed at RFP were ferruginous hawk, loggerhead shrike, and Preble's meadow jumping mouse.

6.0 CONCLUSIONS

- Two federal endangered species, three federal candidates, and one Colorado candidate species occur on RFP.

- A diverse and healthy terrestrial and aquatic ecosystem, based on species diversity and abundance, occurs at RFP.
- The riparian habitats (hydric zone), with 253 plant species and 271 animal taxa, have the greatest species abundance and diversity. Though riparian habitats represent only 5 percent of the total area at RFP, impacts to these habitats would have a disproportionately large adverse effect on plant and animal populations at RFP.
- Mesic mixed grasslands is the largest plant community covering 54 percent of RFP. The mesic zone includes 77 percent of all plant communities at RFP.
- Woman Creek, Walnut Creek, and Rock Creek watersheds each provide important habitat for wildlife. Woman Creek drainage provides 70 percent of the riparian woodland community on site; Walnut Creek drainage provides the most open water, which attracts waterfowl; Rock Creek has the most diverse habitats, and because of topography and plant communities, provides fawning areas for mule deer and other animals.
- Industrial activities (buildings, roadways, parking lots, and storage areas) affect 20 percent of Walnut Creek watershed and 12 percent of all watersheds at RFP.
- Recovery of disturbed plant communities at RFP and re-development of native plant communities proceeds slowly because of the semiarid climate.

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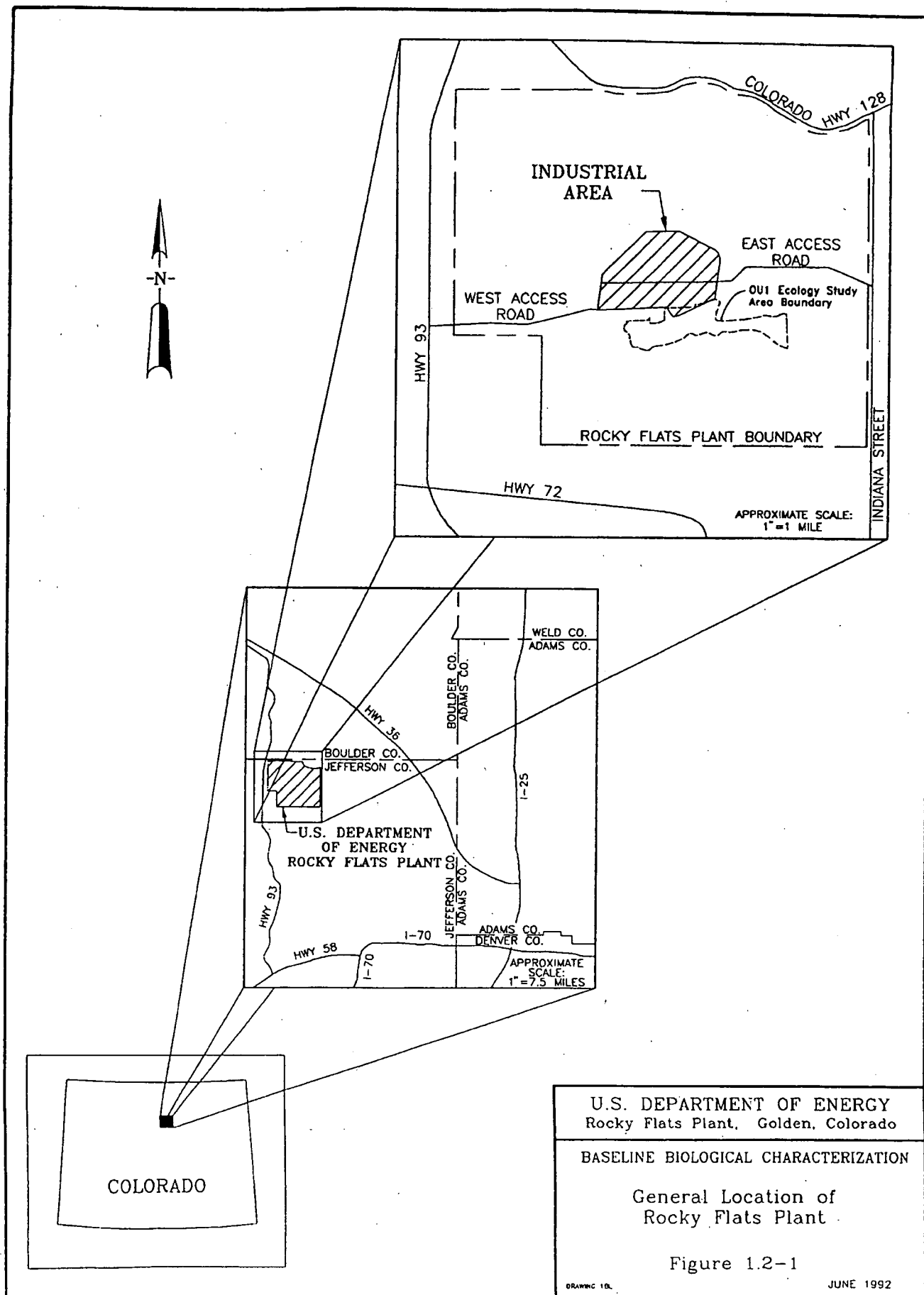
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SECTION 8.0

FIGURES



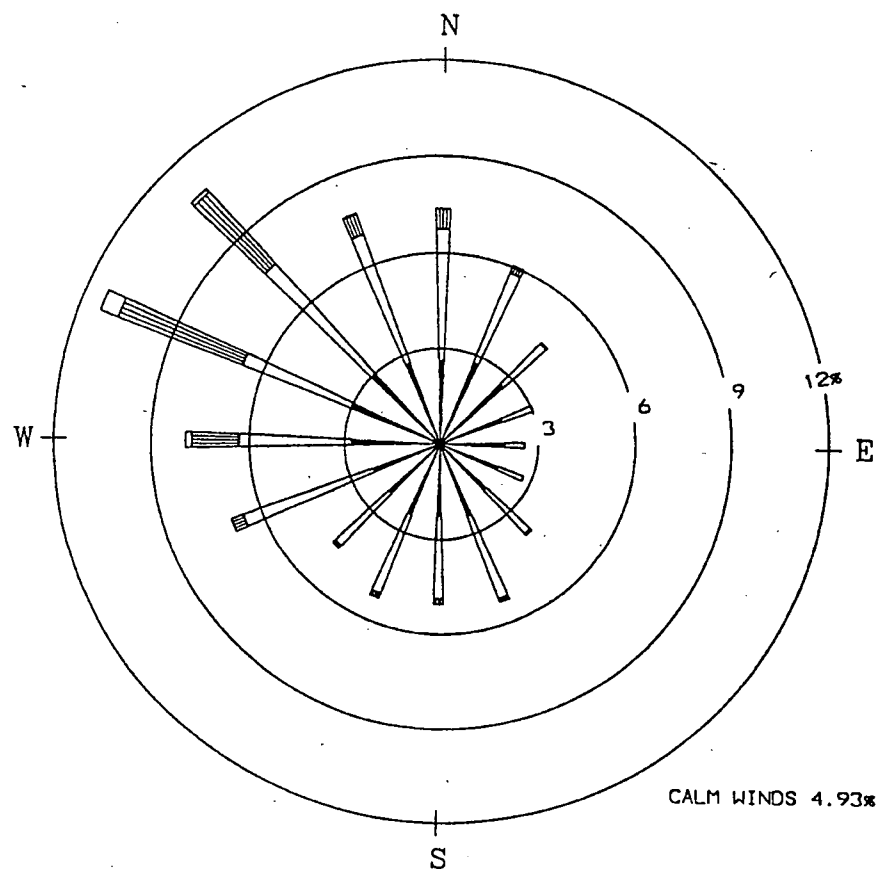
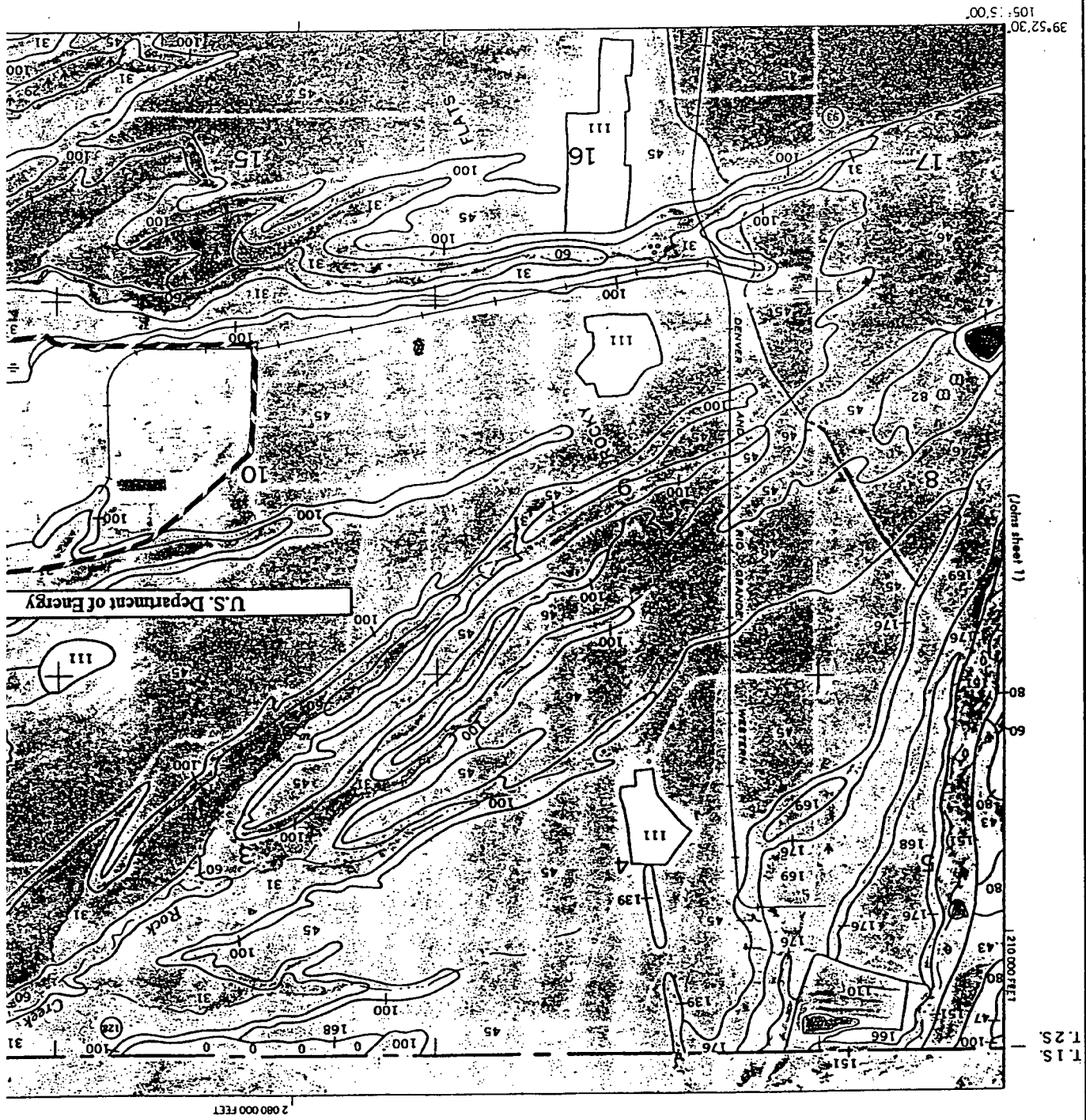


Figure 2.2-1 Wind Rose for Rocky Flats Plant, 1989 and 1990 Combined Data

Source: DOE 1989, 1990a



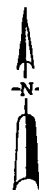
INSET B



INDEX TO SOIL MAP UNITS AT RFP

- 26-27 Denver clay loam
- 28 Denver cobbly clay loam
- 29-30 Denver-Kutch clay loams
- 31 Denver-Kutch-Midway clay loams
- 41-42 Eaglewood clay loam
- 45 Flatirons very cobbly sandy loam
- 46 Flatirons very stony sandy loam
- 60 Haverson loam
- 80 Leyden-Primen-Standley cobbly clay loams
- 98 Midway clay loam
- 100 Nederland very cobbly sandy loam
- 102-103 Nunn clay loam
- 111 Pits, gravel
- 128 Redmun clay loam
- 139 Rock outcrop, sedimentary
- 149 Standley-Nunn gravelly clay loams
- 168 Valmont clay loam
- 169 Valdkamp-Nederland very cobbly sandy loams
- 174 Willowman-Leyden cobbly loams
- 176 Yoder Variant-Midway complex

— Approximate Industrial Area Boundary



0 805
Meters

0 2640
Feet

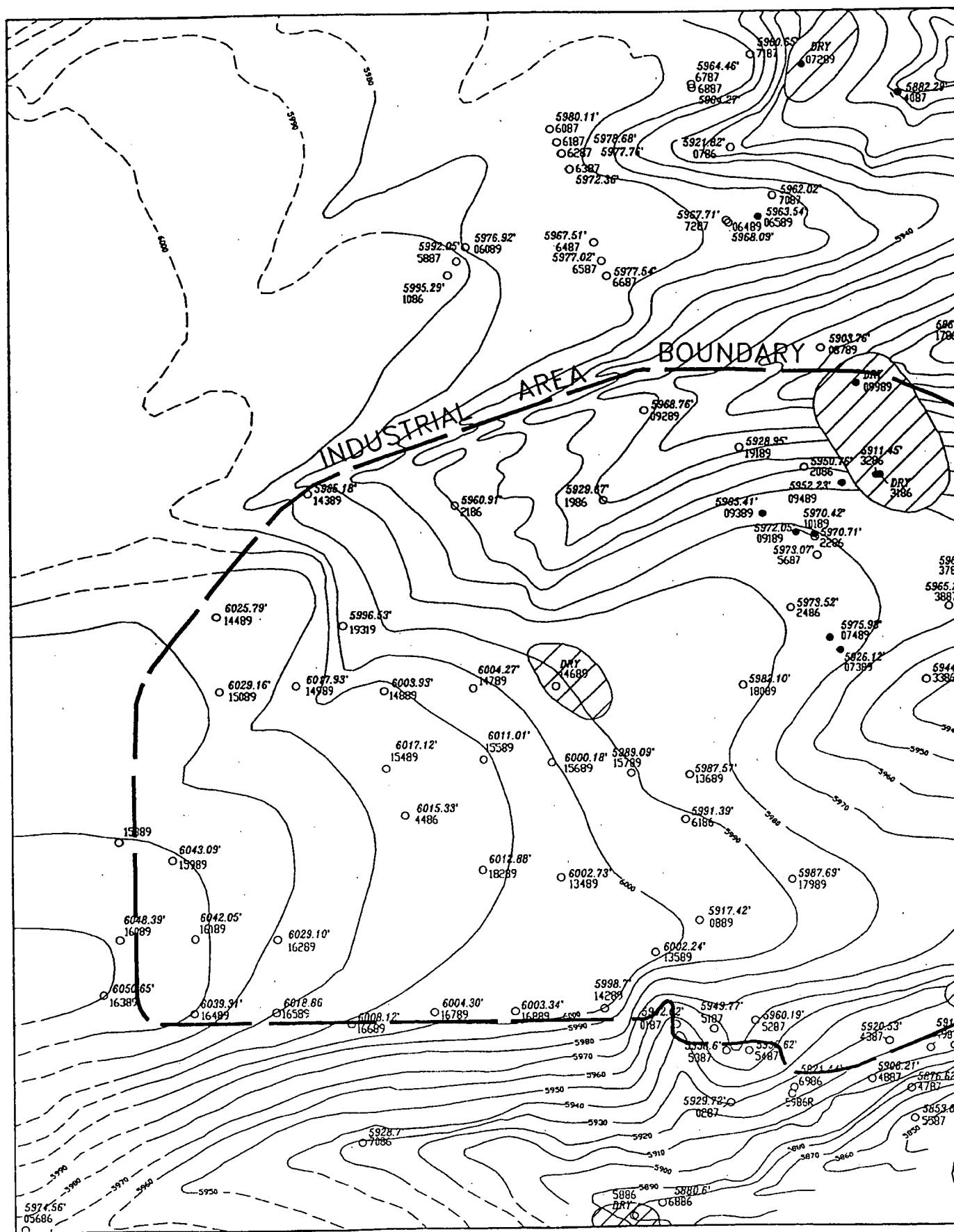
U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant
Golden, Colorado

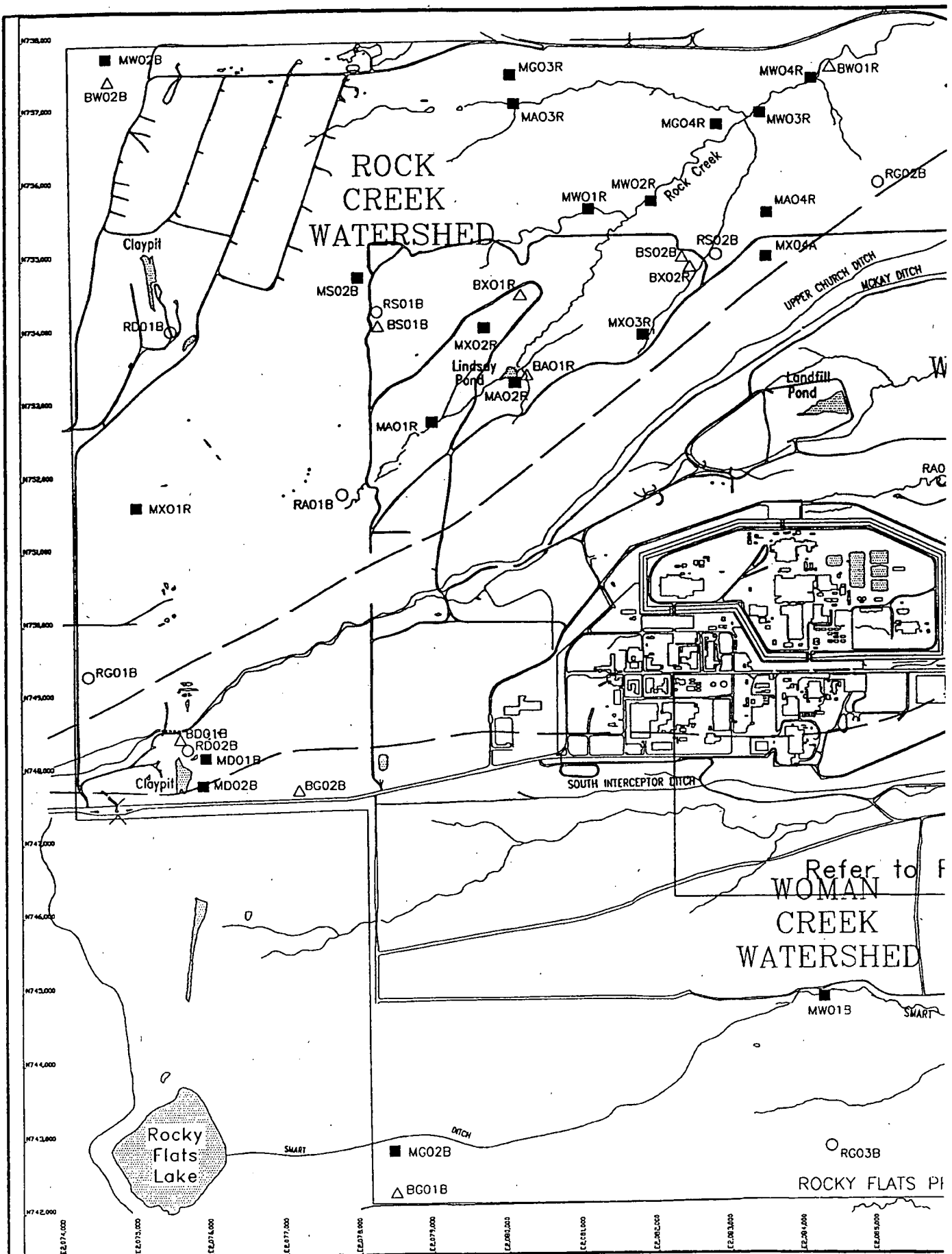
BASELINE BIOLOGICAL CHARACTERIZATION
Soils Map of
Rocky Flats Plant, 1980

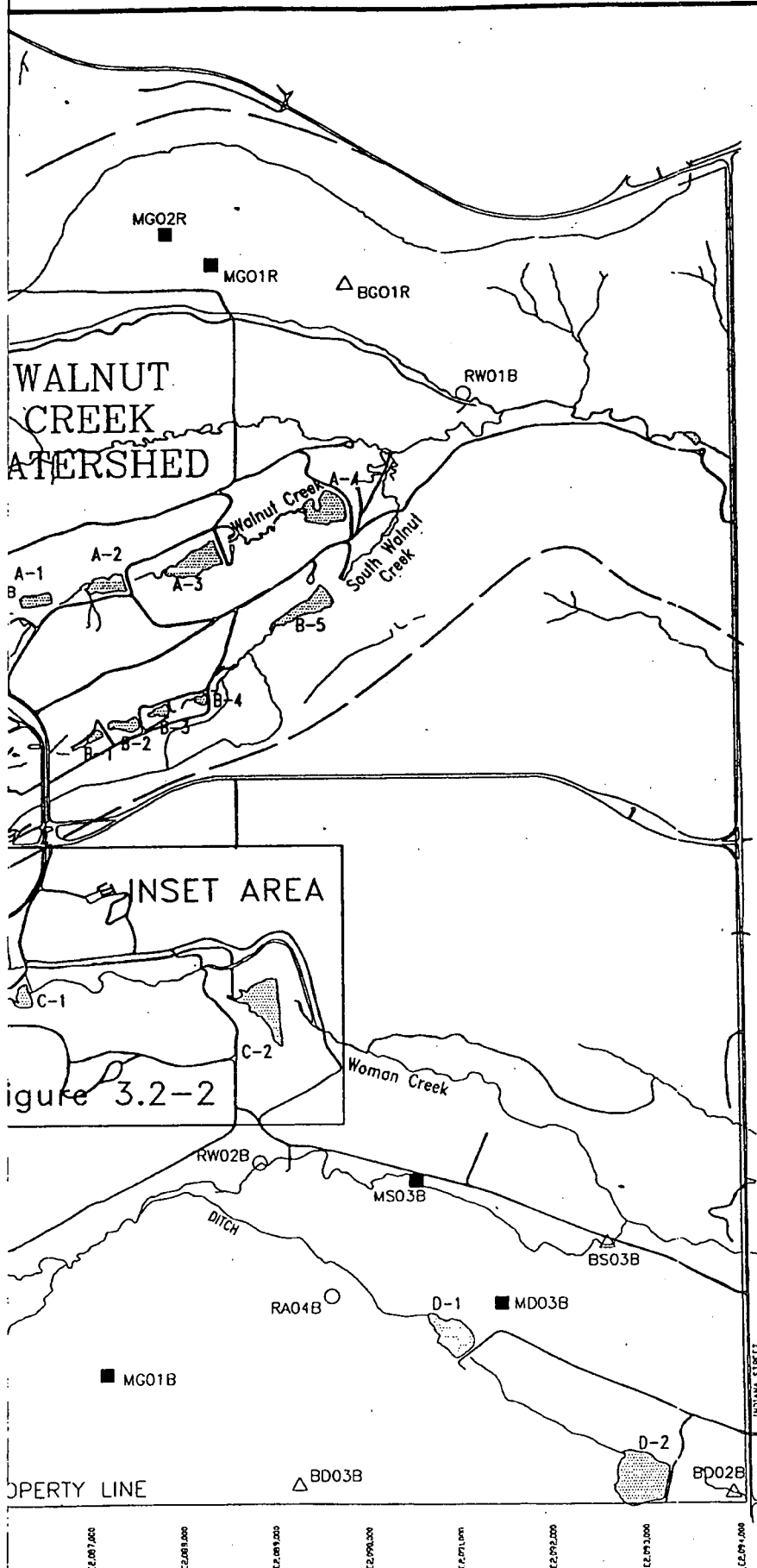
Figure 2.4-1

Adapted from USDA

AUGUST 1992







LEGEND

○ Relative Abundance Transect Start Point

△ Bird Survey Transect Start Point

■ Small Mammal Site

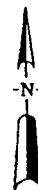
R Suffix indicates OU1 reference site

B Suffix indicates Baseline site

— Watershed Boundaries

Open Water

Note: For terrestrial sample sites in Inset Area, refer to Figure 3.2-2



0 305 610

Scale in Meters

0 1000 2000

Scale in Feet

U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant
Golden, Colorado

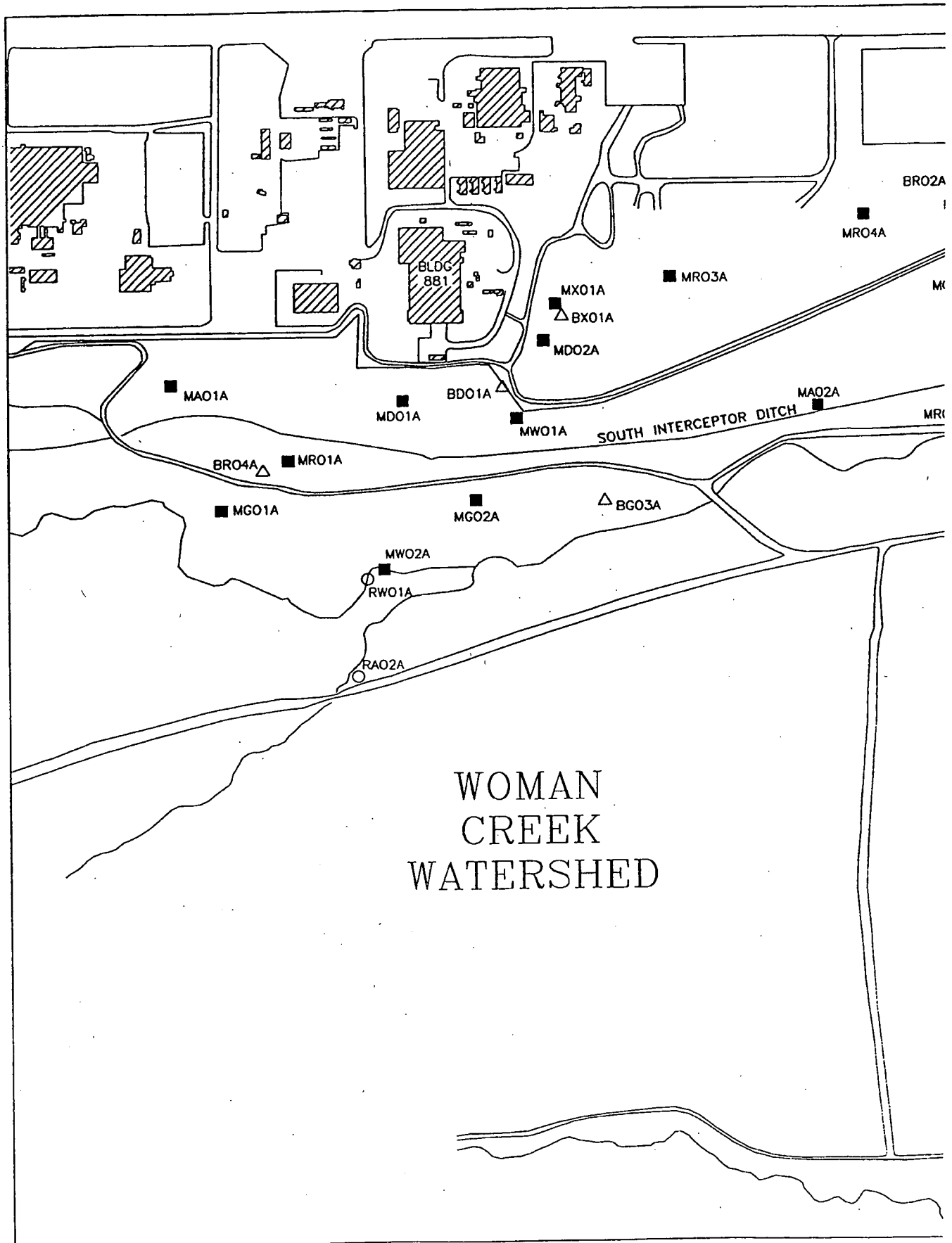
BASELINE BIOLOGICAL CHARACTERIZATION

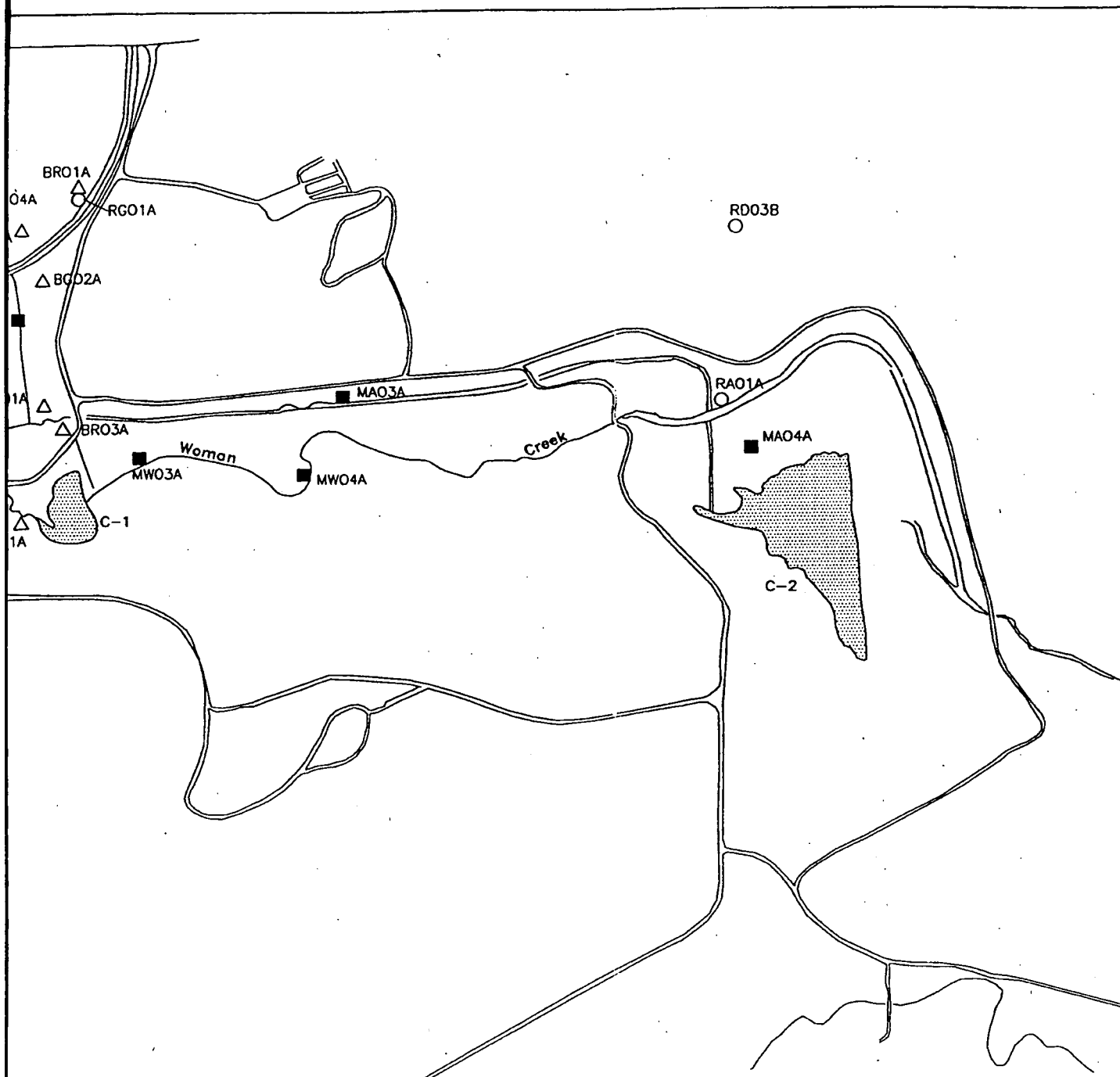
Terrestrial Sample Sites

Figure 3.2-1

Drawing 40L-1

AUGUST 1992





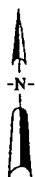
LEGEND

△ Bird Survey Transect (Emlen)
Start Point

○ Relative Abundance Transect
Start Point

■ Small Mammal Site

A Suffix indicates OU1 study site



0 150
Scale in Meters

0 500
Scale in Feet

U.S. DEPARTMENT OF ENERGY Rocky Flats Plant Golden, Colorado

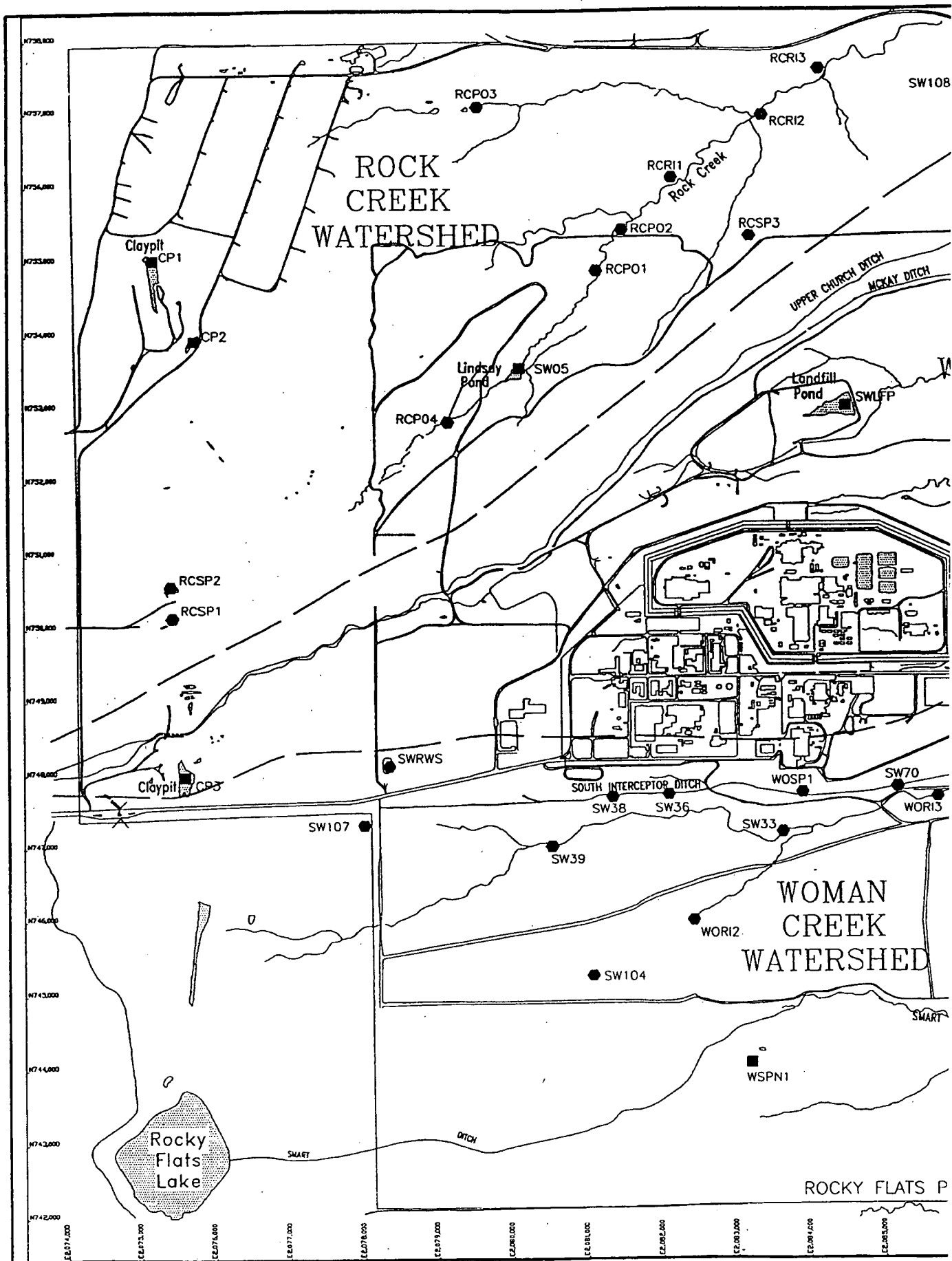
BASELINE BIOLOGICAL CHARACTERIZATION

Terrestrial Sample Sites
(Inset Area from Figure 3.2-1)

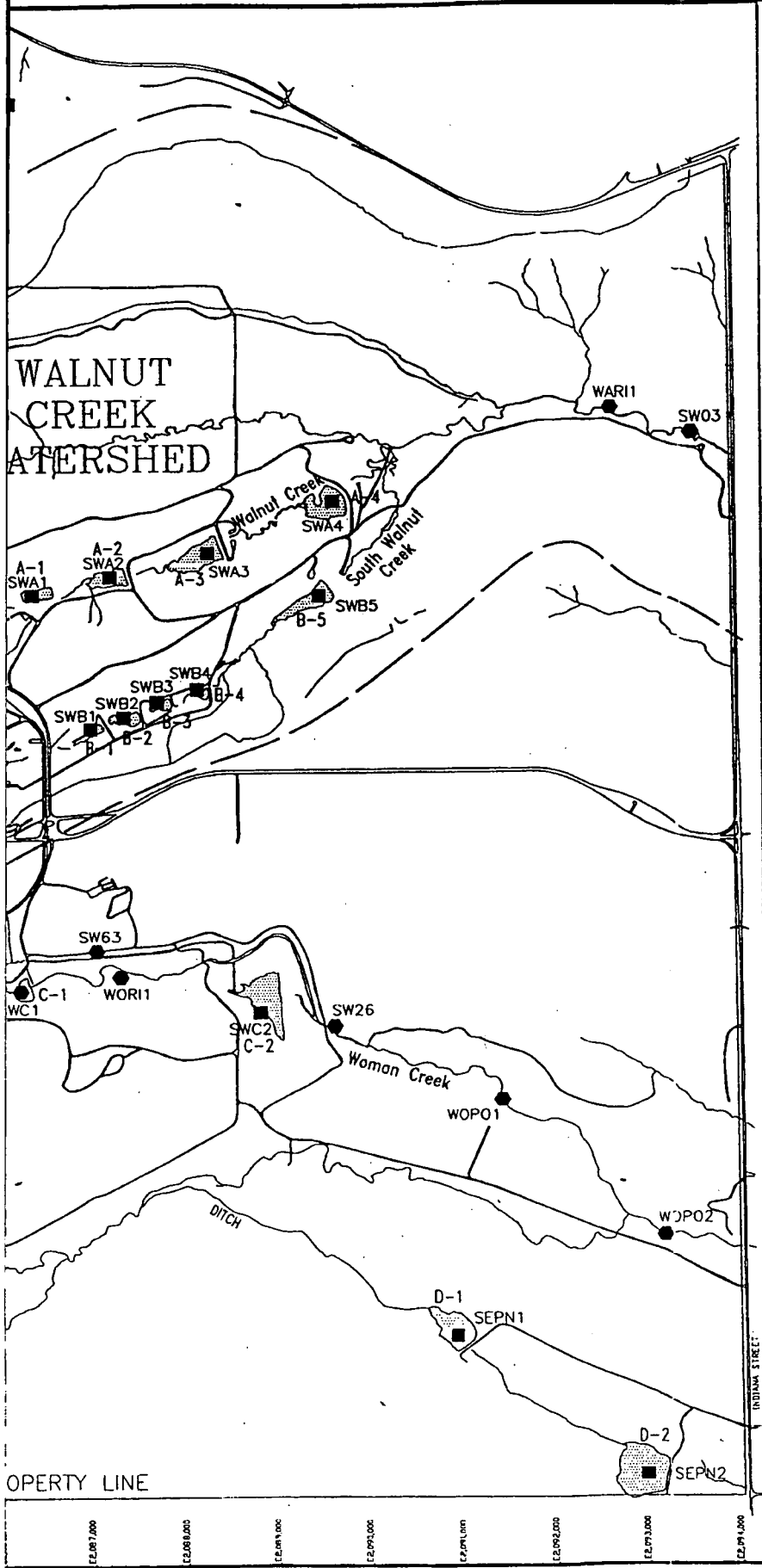
Figure 3.2-2

Drawing JBL-1

AUGUST 1992



WALNUT CREEK WATERSHED

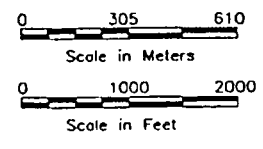
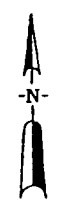


LEGEND

- Pond Study Sites
- Stream Study Sites
- Open Water
- Watershed Boundaries

Pond Stations

- A-1 = SWA1
- A-2 = SWA2
- A-3 = SWA3
- A-4 = SWA4
- B-1 = SWB1
- B-2 = SWB2
- B-3 = SWB3
- B-4 = SWB4
- B-5 = SWB5
- C-1 = SWC1
- C-2 = SWC2
- D-1 = SEP1
- D-2 = SEP2

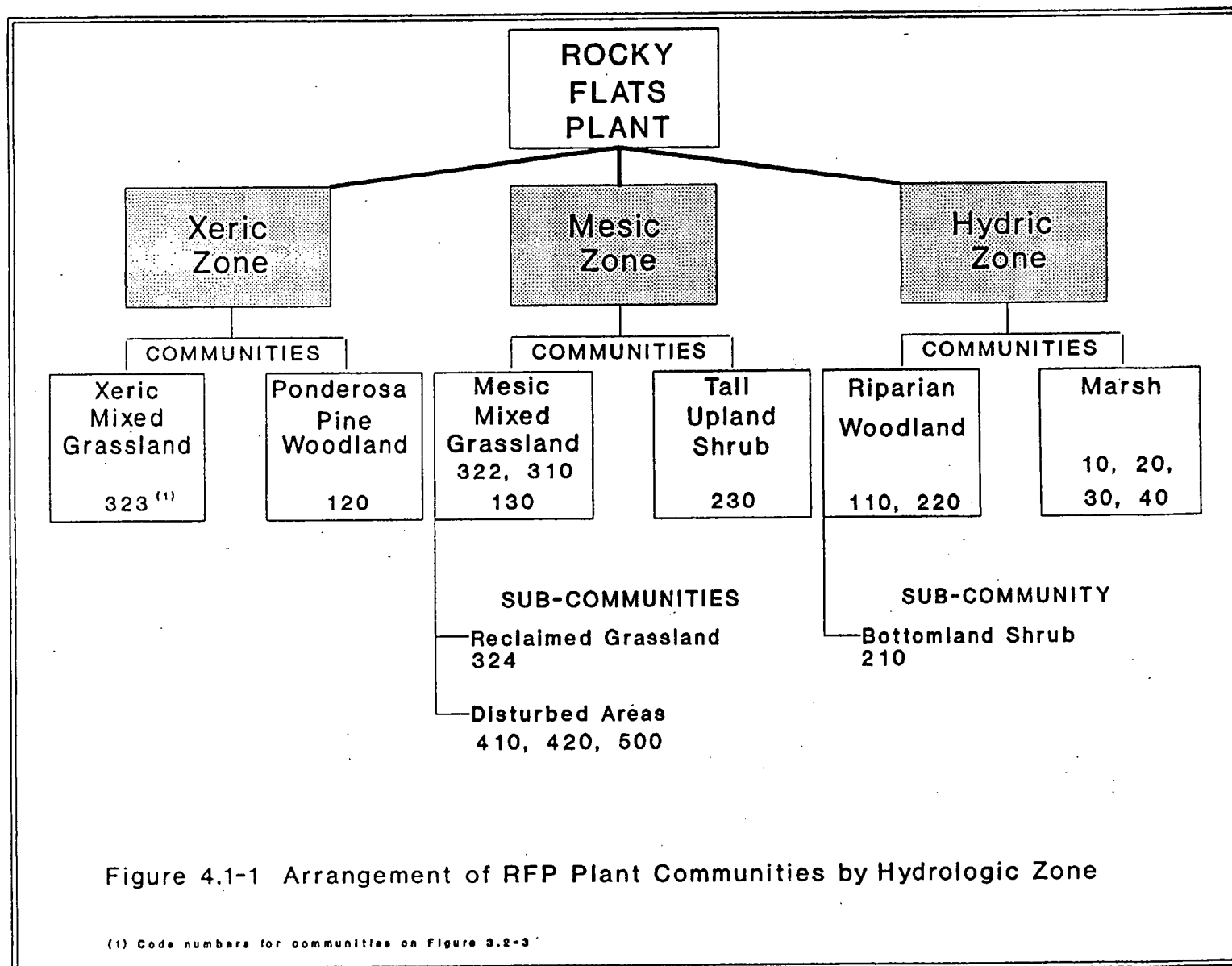


U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant
Golden, Colorado

BASELINE BIOLOGICAL CHARACTERIZATION

Aquatic Study Sites

Figure 3.3-1



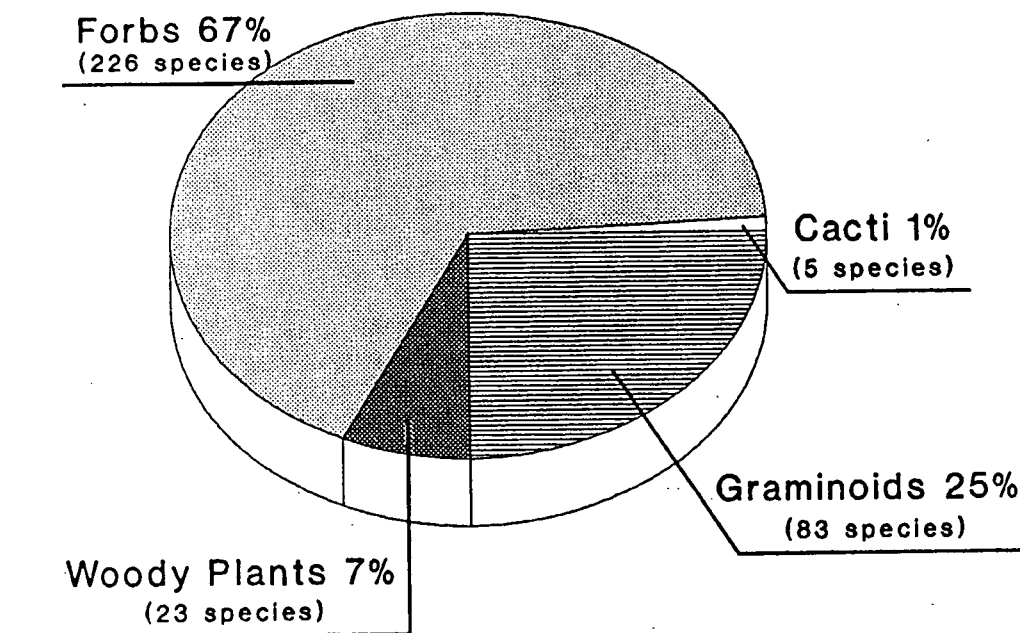
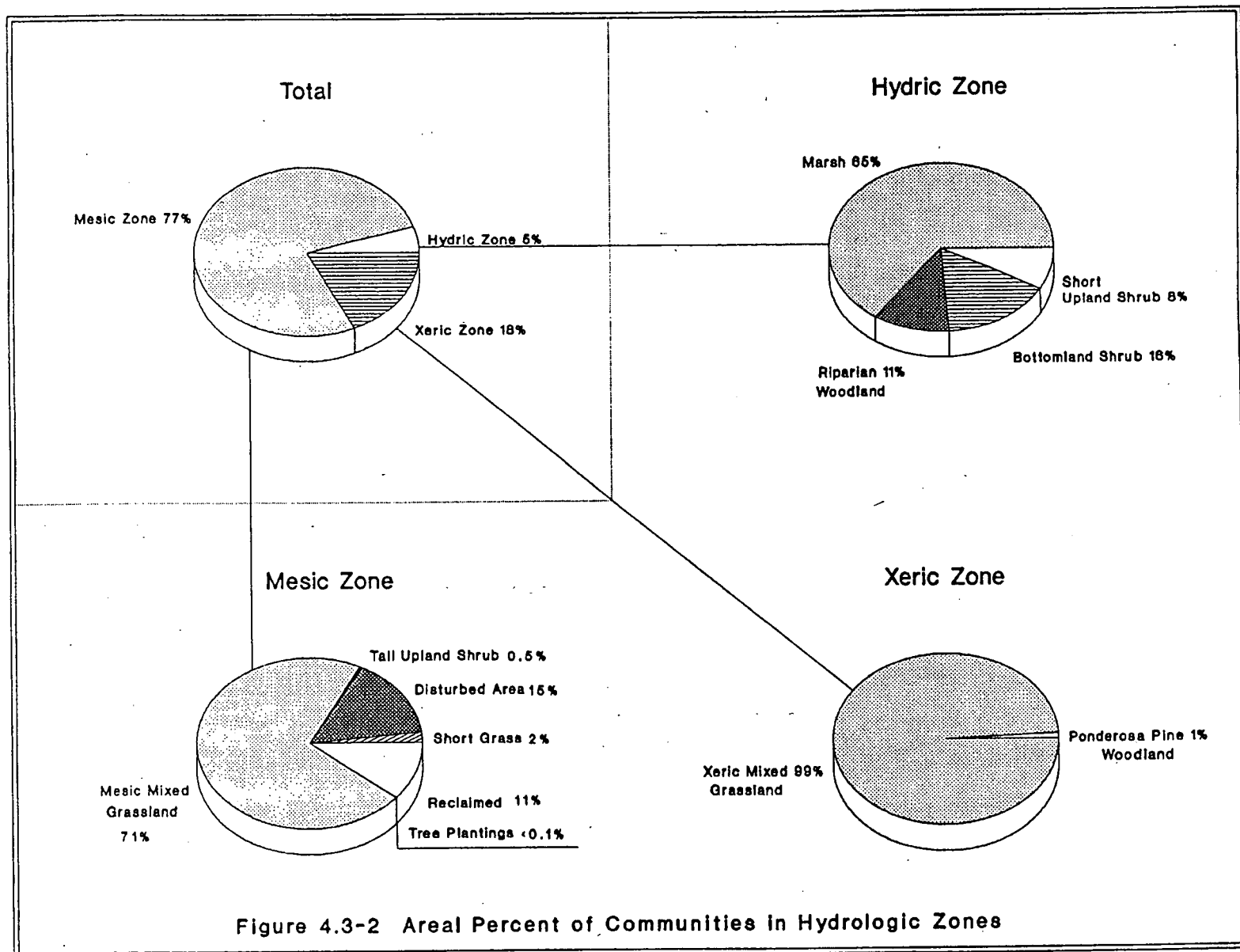
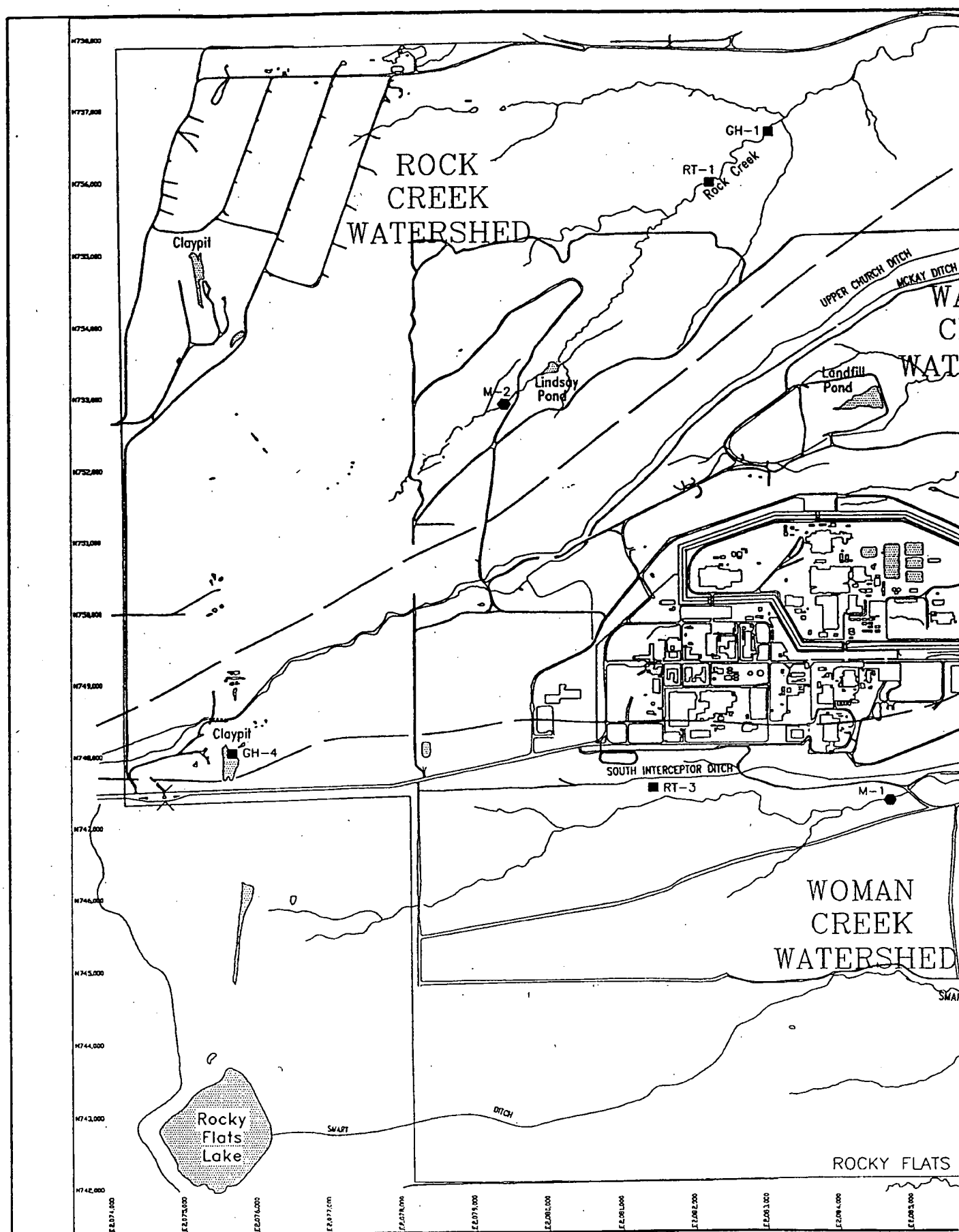
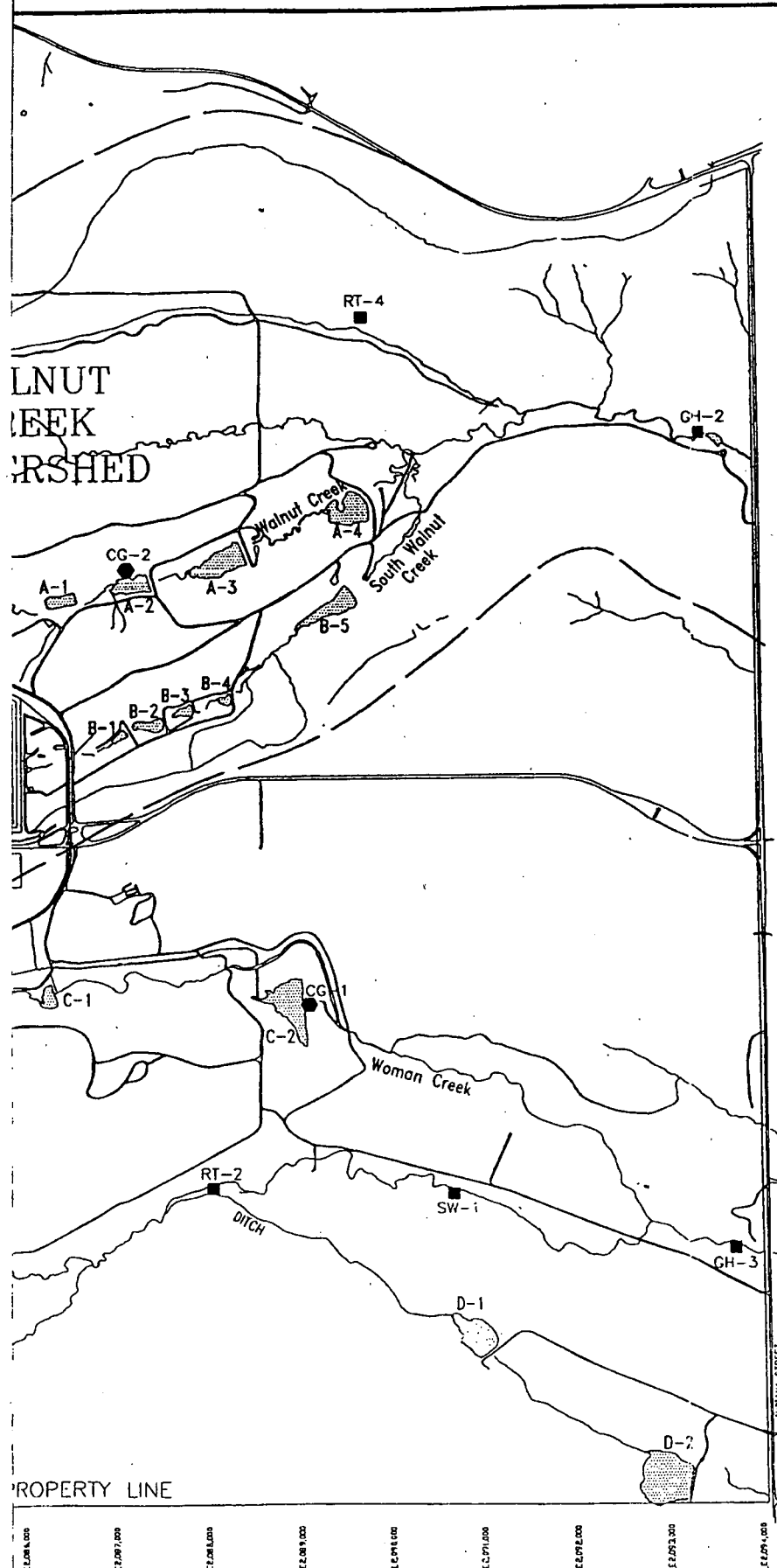


Figure 4.3-1 Percentages of Plant Species by Growth-form at Rocky Flats Plant, 1991

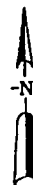






LEGEND

- Raptor Nest Location
- Waterfowl Nest Location
- Watershed Boundary
- Open Water



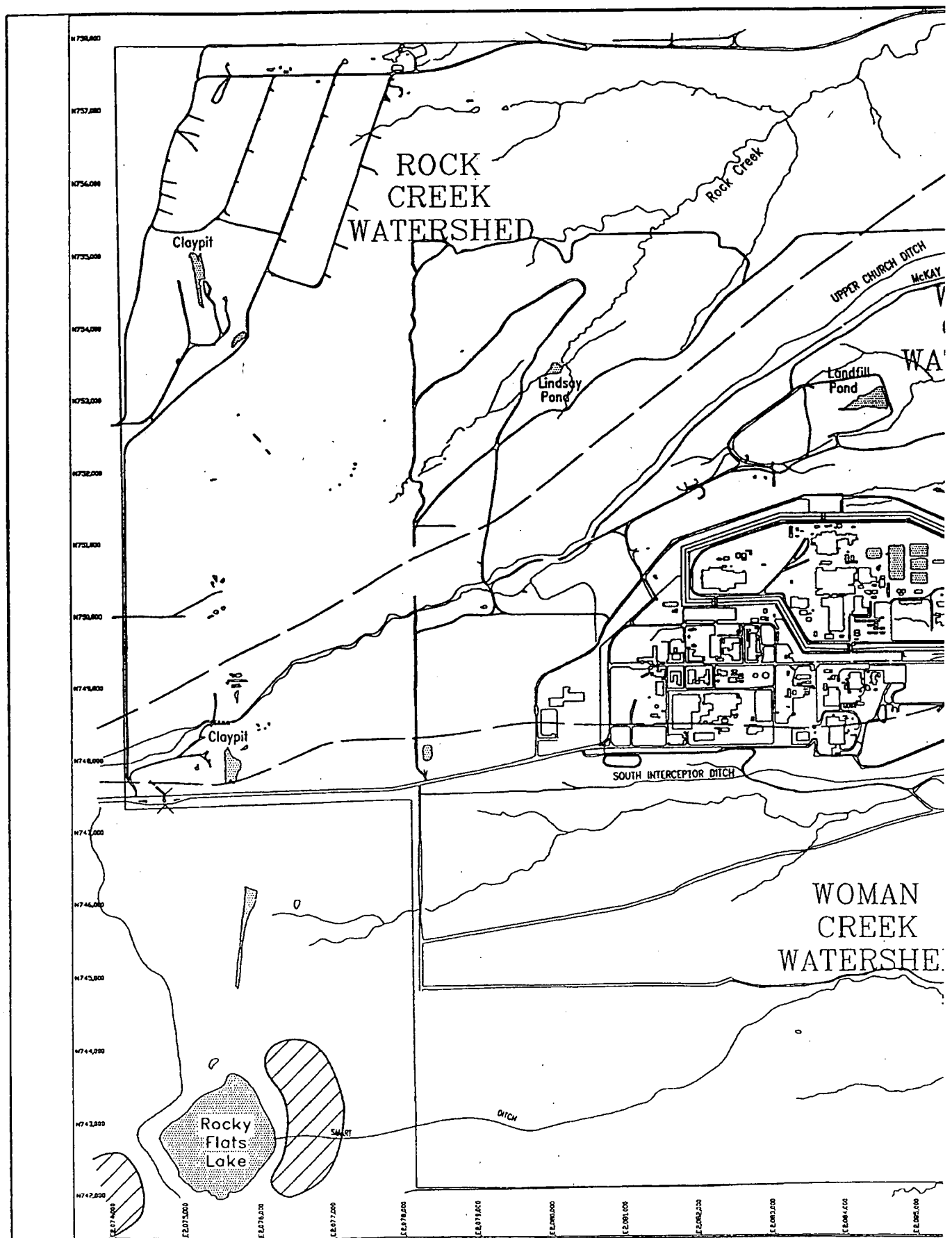
U.S. DEPARTMENT OF ENERGY
Rocky Flats Plant
Golden, Colorado

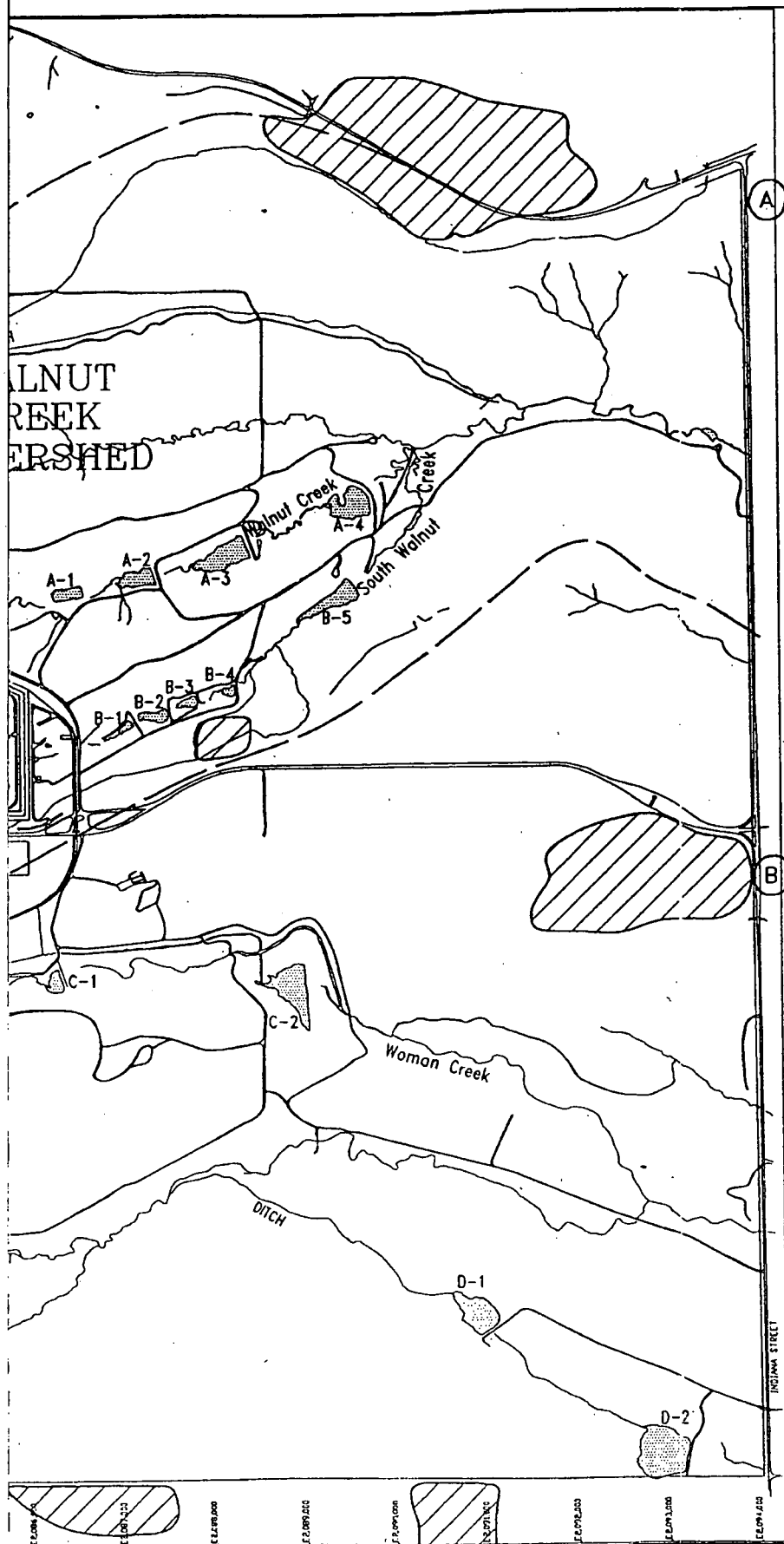
BASELINE BIOLOGICAL CHARACTERIZATION

Raptor and Waterfowl Nest
Locations, 1991
Figure 4.3-3

Drawing DBL-1

AUGUST 1991





August 1992

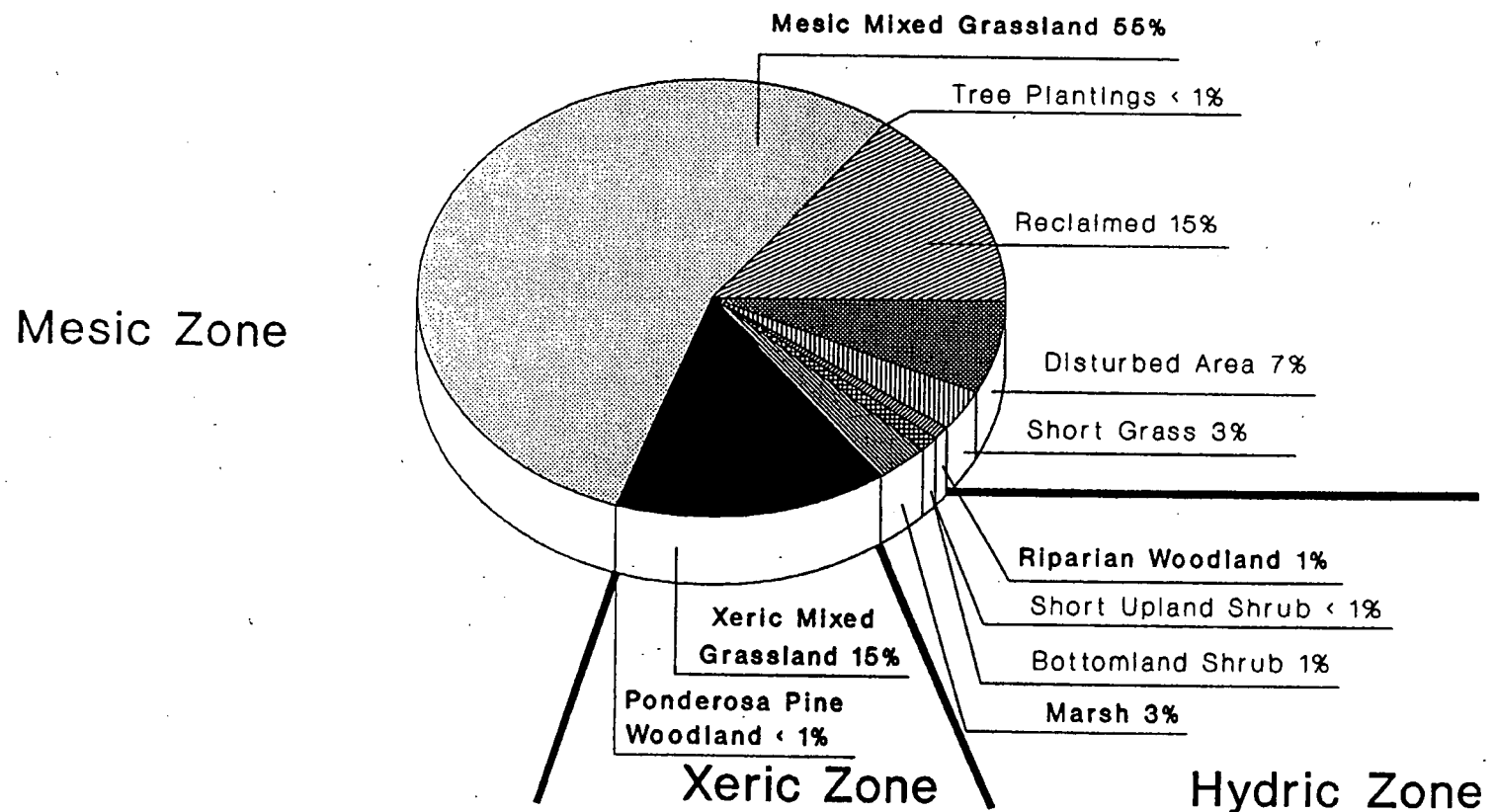


Figure 4.3-5 Plant Communities in Woman Creek Watershed at Rocky Flats Plant, 1991

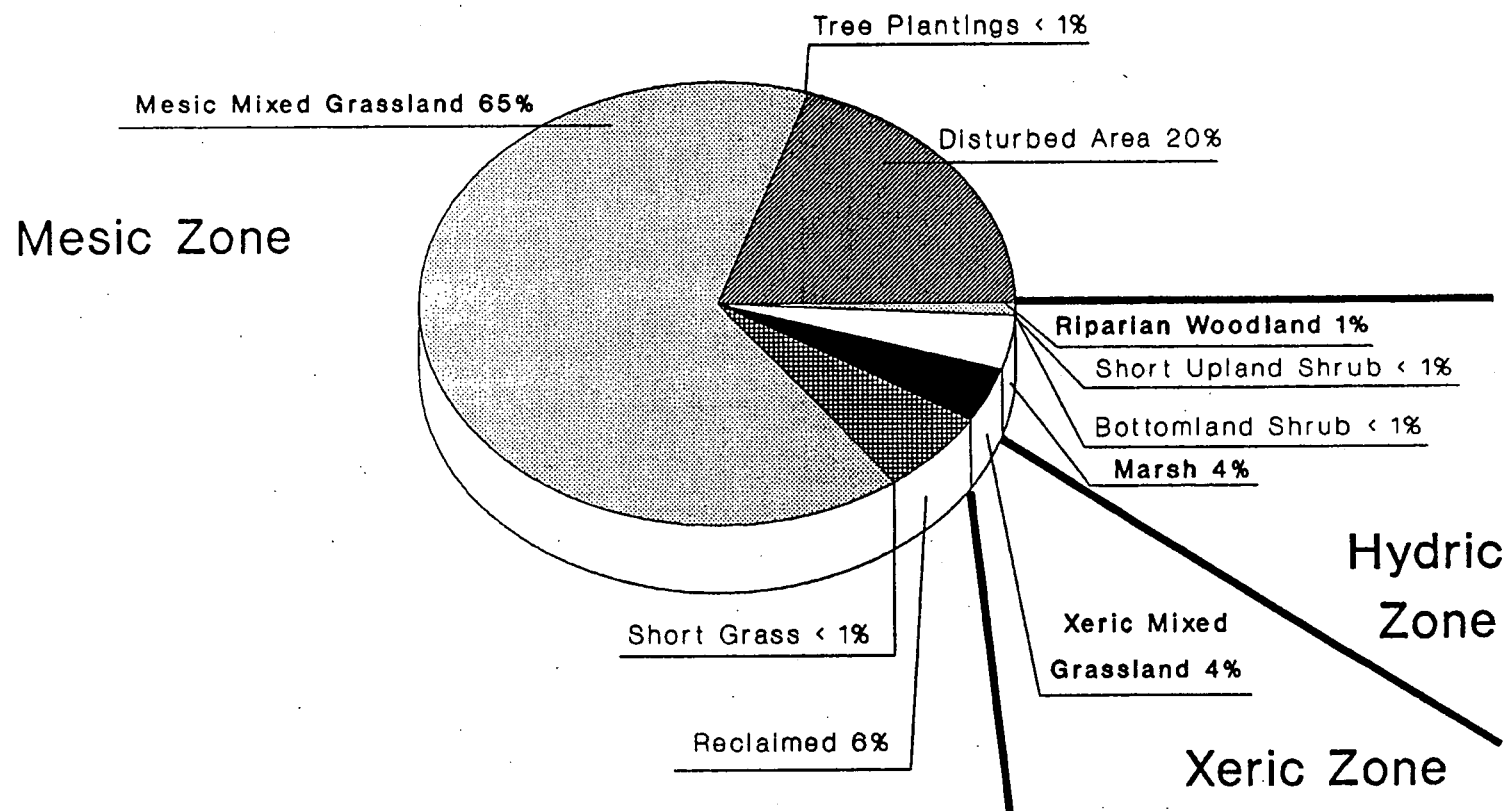
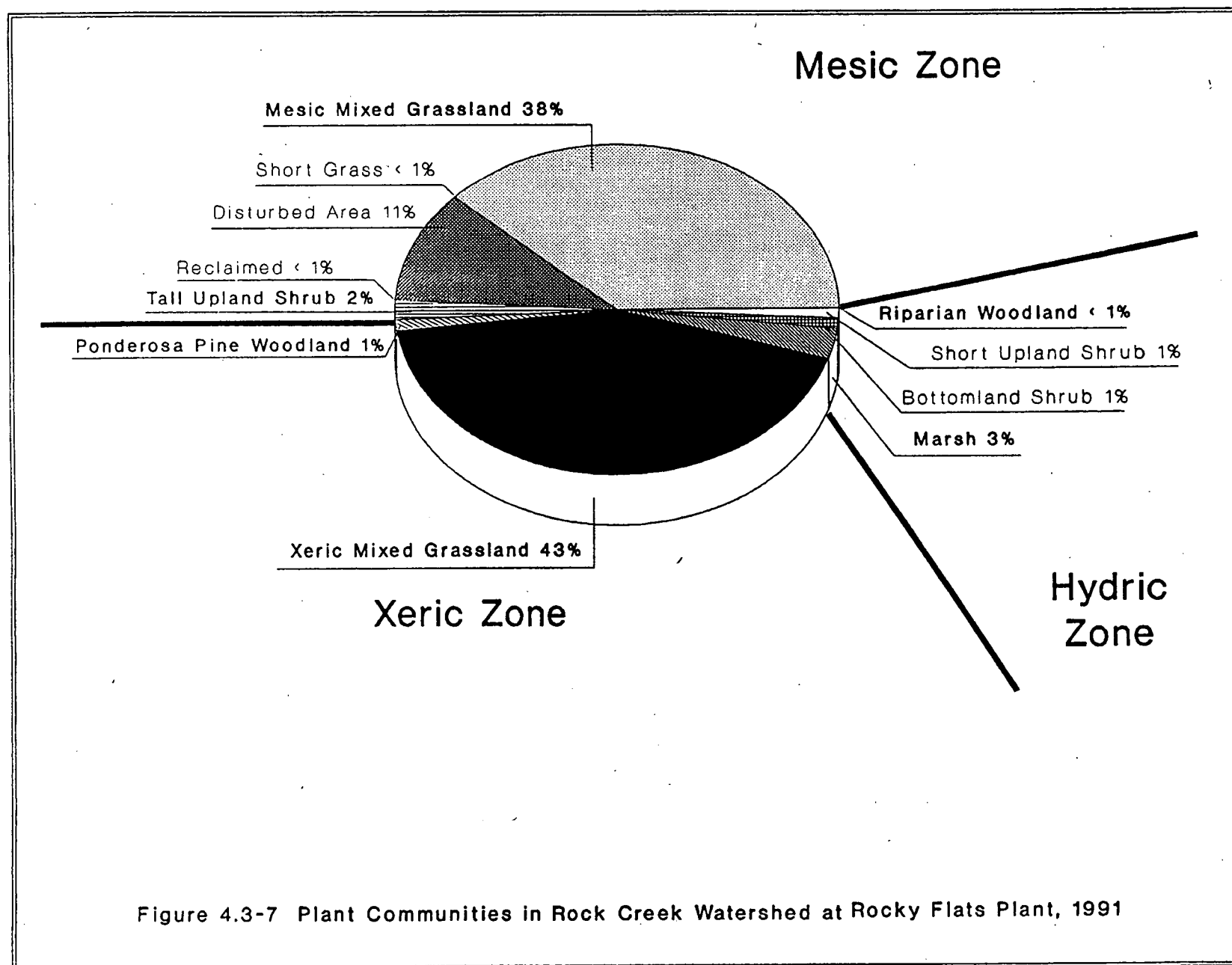


Figure 4.3-6 Plant Communities in Walnut Creek Watershed at Rocky Flats Plant, 1991



SECTION 9.0

TABLES

Table 2.2-1. Percent Wind Direction by Four Wind-Speed Classes at Rocky Flats Plant, 1989 and 1990

Wind Direction	Calm	1 to 3 m/sec	3 to 7 m/sec	7 to 15 m/sec	> 15 m/sec	Total
None	4.93	-	-	-	-	4.93
N	-	2.63	4.12	0.63	0.01	7.39
NNE	-	2.76	3.02	0.26	0.01	6.05
NE	-	2.60	1.80	0.05	0.00	4.45
ENE	-	2.00	1.02	0.01	0.00	3.03
E	-	1.95	0.62	0.01	0.00	2.58
ESE	-	1.90	0.83	0.01	0.00	2.74
SE	-	1.95	1.86	0.07	0.00	3.88
SSE	-	2.42	2.74	0.14	0.00	5.30
S	-	2.26	2.61	0.20	0.00	5.07
SSW	-	2.40	2.66	0.17	0.00	5.23
SW	-	2.15	2.29	0.14	0.00	4.58
WSW	-	2.22	4.34	0.41	0.00	6.97
W	-	2.77	3.55	1.44	0.18	7.94
WNW	-	3.01	3.64	4.10	0.58	11.33
NW	-	2.93	4.71	3.02	0.13	10.79
NNW	-	2.72	4.26	0.70	0.01	7.69

Source: DOE 1989, 1990a

Table 3.2.1-1. Characteristic Species of Plant Communities Mapped at Rocky Flats Plant, 1991 (1)

XERIC ZONE		(Adapted to dry conditions)	
Xeric Mixed Grassland	Ponderosa Pine Woodland		
Junegrass	Ponderosa Pine		
Red Threawn	Skunkbrush Sumac		
Cheatgrass	Ninebark		
Western Wheatgrass	Wax Currant		
Big Bluestem	Junegrass		
Little Bluestem	Canada Bluegrass		
Blue Gramma	Spring Beauty		
Hairy Gramma			
Sedges			
Needlegrass			
Alyssum			
Arnica			
Sages (several)			
White Aster			
Fleabane (several)			
Milkveitch (several)			
Golden Aster			
Curly-top Gumweed			
Blazing Star			
Cacti (several)			
MESIC ZONE		(Adapted to medium moisture conditions)	
Mesic Mixed Grassland	Short Grassland	Reclaimed Grassland	Tall Upland Shrub
Big Bluestem	Buffalo grass	Smooth Brome	Hawthorn
Little Bluestem	Blue Gramma	Western Wheatgrass	Chokecherry
Prairie Dropseed	Cheatgrass		Wild Plum
Canada Bluegrass	Red Threawn		Western Wheatgrass
White Sage	Cacti (several)		Canada Bluegrass
Blue Gramma			Kentucky Bluegrass
Side-oats Gramma			Yarrow
Cheatgrass			Aster
Alyssum			Larkspur
Milkveitch (several)			Catnip
Fleabane (several)			Poison Ivy
Golden Aster			
Larkspur			
Arnica			
Snakeweed			
Blazing Star			

Table 3.2.1-1. Characteristic Species of Plant Communities Mapped at Rocky Flats Plant, 1991 (1)

MESIC ZONE (CREATED HABITATS)		(These communities fall within the mesic zone)	
Disturbed Areas (Annual Grass/Forb)	Disturbed Areas (Disturbed/Barren Land)	Disturbed Areas Developed Areas (2)	Tree Plantings
Cheatgrass	Cheatgrass	Structures	Apple
Red Threawn	Knapweed	Roads	Black Locust
Japanese Brome	Sunflower	Utility lines	White Poplar
Knapweed	Recent disturbance		Russian Olive
Sunflower	Exposed bedrock		
Sweet Clover			
HYDRIC ZONE		(Adapted to wet conditions)	
Riparian Woodland	Short Upland Shrub	Bottomland Shrub	Wet Meadow
Cottonwood	Snowberry	Leadplant	Kentucky Bluegrass
Willows (several)	Skunkbrush Sumac	Willows (several)	Canada Bluegrass
Arkansas Rose	Ninebark	Field Mint	Western Wheatgrass
Sedges (several)		Canada Bluegrass	Smooth Brome
Rushes (several)		Western Wheatgrass	Prairie Cordgrass
Kentucky Bluegrass			Sedges (several)
Cattails (two)			
Ragweed			
HYDRIC ZONE (Continued)		(Adapted to wet conditions)	
Short Marsh	Tall Marsh	Open Water (2)	
Sedges (several)	Cattails (two)	Impounded Water	
Rushes (several)	Bulrushes	In-Stream Pools	
	Rushes		

- (1) Communities are grouped according to hydrologic zones.
- (2) These are important habitats, though not plant communities, and were mapped to complete the description of the ground surface coverage at RFP.

Table 3.2.2-1. Species of Special Interest at Rocky Flats Plant

INVERTEBRATES

Montane Pawnee Skipper *

Hesperia leonardus montanus

FISH

Johnny Darter *

Etheostoma nigrum

Plains Topminnow *

Fundulus sciadicus

REPTILES

Texas Horned Lizard *

Phrynosoma conutum

WATERFOWL AND SHOREBIRDS

Common Loon

Gavia immer

Arctic Loon

Gavia arctica

Red-necked Grebe

Podiceps grisegena

Horned Grebe

Podiceps auritus

Eared Grebe

Podiceps nigricollis

Western Grebe

Aechmophorus occidentalis

Clark's Grebe

Aechmophorus clarkii

Pied-billed Grebe

Podilymbus podiceps

American White Pelican

Pelicanus erythrorhynchos

Double-crested Cormorant

Phalacrocorax auritus

Great Blue Heron

Ardea herodias

Green-backed Heron

Butorides striatus

Snowy Egret

Egretta thula

Black-crowned Night-Heron

Nycticorax nycticorax

White-faced Ibis *

Plegadis chihi

Tundra Swan

Cygnus columbianus

Canada Goose

Branta canadensis

Greater White-fronted Goose

Anser albifrons

Snow Goose

Chen caerulescens

Mallard

Anas platyrhynchos

Gadwall

Anas strepera

Pintail

Anas acuta

Green-winged Teal

Anas crecca

Blue-winged Teal

Anas discors

Cinnamon Teal

Anas cyanoptera

American Wigeon

Anas americana

Northern Shoveler

Anas clypeata

Wood Duck

Aix sponsa

Redhead

Aythya americana

Ring-necked Duck

Aythya collaris

Canvasback

Aythya valisineria

Greater Scaup

Aythya marila

Lesser Scaup

Aythya affinis

Common Goldeneye

Bucephala clangula

Table 3.2.2.-1. Species of Special Interest at Rocky Flats Plant (Continued) Page 2 of 3

WATERFOWL AND SHOREBIRDS (Cont.)

Bufflehead	<i>Bucephala albeola</i>
Harlequin Duck *	<i>Histrionicus histrionicus</i>
Oldsquaw	<i>Clangula hyemalis</i>
Ruddy Duck	<i>Oxyura jamaicensis</i>
Hooded Merganser	<i>Lophodytes cucullatus</i>
Common Merganser	<i>Mergus merganser</i>
Red-breasted Merganser	<i>Mergus serrator</i>
Piping Plover *	<i>Charadrius melodus</i>
Mountain Plover *	<i>Charadrius montanus</i>
Long-billed Curlew *	<i>Numenius americanus</i>
Sandhill Crane	<i>Grus canadensis</i>
Whooping Crane *	<i>Grus americana</i>
American Coot	<i>Fulica americana</i>
Least Tern *	<i>Sterna antillarum</i>

RAPTORS

Turkey Vulture	<i>Cathartes aura</i>
Northern Goshawk	<i>Accipiter gentilis</i>
Sharp-shinned Hawk	<i>Accipiter striatus</i>
Cooper's Hawk	<i>Accipiter cooperi</i>
Red-tailed Hawk	<i>Buteo jamaicensis</i>
Broad-winged Hawk	<i>Buteo platypterus</i>
Swainson's Hawk	<i>Buteo swainsoni</i>
Rough-legged Hawk	<i>Buteo lagopus</i>
Ferruginous Hawk *	<i>Buteo regalis</i>
Golden Eagle	<i>Aquila chrysaetos</i>
Bald Eagle *	<i>Haliaeetus leucocephalus</i>
Northern Harrier	<i>Circus cyaneus</i>
Osprey	<i>Pandion haliaetus</i>
Gyr Falcon	<i>Falco rusticolus</i>
Prairie Falcon	<i>Falco mexicanus</i>
Peregrine Falcon *	<i>Falco peregrinus</i>
Merlin	<i>Falco columbarius</i>
American Kestrel	<i>Falco sparverius</i>
Barn Owl	<i>Tyto alba</i>
Western Screech Owl	<i>Otus kennicottii</i>
Flammulated Owl	<i>Otus flammeolus</i>
Great Horned Owl	<i>Bubo virginianus</i>
Snowy Owl	<i>Nyctea scandiaca</i>
Burrowing Owl	<i>Athene cunicularia</i>
Long-eared Owl	<i>Asio otus</i>
Short-eared Owl	<i>Asio flammeus</i>
Northern Saw-whet Owl	<i>Aegolius acadicus</i>

Table 3.2.2.-1. Species of Special Interest at Rocky Flats Plant (Continued) Page 3 of 3

GAME BIRDS

Sharp-tailed Grouse *	<i>Tympanuchus phasianellus</i>
Bobwhite	<i>Colinus virginianus</i>
Ring-necked Pheasant	<i>Phasianus colchicus</i>
Chukar	<i>Alectoris chukar</i>
Wild Turkey	<i>Meleagris gallopavo</i>

SMALL MAMMALS

Preble's Meadow Jumping Mouse *	<i>Zapus hudsonius preblei</i>
---------------------------------	--------------------------------

MEDIUM-SIZED MAMMALS

Eastern Cottontail	<i>Sylvilagus floridanus</i>
Desert Cottontail	<i>Sylvilagus audubonii</i>
Whitetail Jackrabbit	<i>Lepus townsendii</i>
Blacktail Jackrabbit	<i>Lepus californicus</i>
Black-tailed Prairie Dog	<i>Cynomys ludovicianus</i>
Fox Squirrel	<i>Sciurus niger</i>
Northern Pocket Gopher	<i>Thomomys talpoides</i>
Plains Pocket Gopher	<i>Geomys bursarius</i>
Beaver	<i>Castor canadensis</i>
Muskrat	<i>Ondatra zibethicus</i>
Porcupine	<i>Erethizon dorsatum</i>

CARNIVORES

Coyote	<i>Canis latrans</i>
Red Fox	<i>Vulpes vulpes</i>
Swift Fox *	<i>Vulpes velox</i>
Gray Fox	<i>Urocyon cinereoargenteus</i>
Raccoon	<i>Procyon lotor</i>
Long-tailed Weasel	<i>Mustela frenata</i>
Black-footed Ferret *	<i>Mustela nigripes</i>
Mink	<i>Mustela vison</i>
Badger	<i>Taxidea taxus</i>
Spotted Skunk	<i>Spilogale putorius</i>
Striped Skunk	<i>Mephitis mephitis</i>
Bobcat	<i>Lynx rufus</i>

LARGE MAMMALS

Mule Deer	<i>Odocoileus hemionus</i>
White-tailed Deer	<i>Odocoileus virginianus</i>
Elk (Wapiti)	<i>Cervus elaphus</i>
Pronghorn	<i>Antilocapra americana</i>

* These species are on either Federal or Colorado Species of Special Concern lists.

Table 4.3.1-1. Summary of Plant Species Numbers by Growth-form

HYDROLOGIC ZONE	XERIC	MESIC				HYDRIC		
COMMUNITY/ SUBCOMMUNITY	Xeric Mixed Grassland	Mesic Mixed Grassland		Tall Upland		Riparian Woodland		Marsh
		Reclaimed	Disturbed	Shrub		Bot. Shrub		
GROWTH-FORM								
Trees and Shrubs	1	2	2	4	9	16	5	5
Cacti	4	5	2	0	1	3	0	0
Graminoids	21	38	25	26	9	54	21	57
Forbs	65	104	50	49	38	135	42	100
Total Number of Species per Community	91	149	79	79	57	208	68	162

Table 4.3.1-2. Areas Occupied by Plant Communities Mapped at Rocky Flats Plant, 1991

Community/ Subcommunity	Map Code No.	Acres	Hectares (1)	Percent of Total
GRASSLANDS				82.3
Short Grass	310	100	40.5	1.5
Mesic Mixed Grassland	322	3554	1438.9	54.3
Xeric Mixed Grassland	323	1174	475.3	17.9
Reclaimed Grassland	324	565	228.7	8.6
DISTURBED AREAS				12.0
Annual Grass/Forb	410	108	43.7	1.6
Disturbed/Barren Lands	420	117	47.4	1.8
Developed Areas	500	560	226.7	8.6
SHRUBLAND				1.6
Bottomland Shrub	210	52	21.1	0.8
Short Upland Shrub	220	28	11.3	0.4
Tall Upland Shrub	230	27	10.9	0.4
WOODLAND				0.7
Riparian Woodland	110	33	13.4	0.5
Ponderosa Pine Woodland	120	15	6.1	0.2
Tree Plantings	130	>1	1.0	0.0
MARSHLAND				3.4
Wet Meadow/Marsh Ecotone	10	13	5.3	0.2
Short Marsh	20	127	51.4	1.9
Tall Marsh	30	39	15.8	0.6
Open Water	40	37	15.0	0.6
Totals of Areas at RFP		6550	2652	100

(1) 1 Hectare = 2.47Acres

Table 4.3.2-1. Woody Plant and Cactus Densities by Community at Rocky Flats Plant, 1991 (1)

Xeric Mixed Grassland (Map Code 323)	Mean	Maximum	Minimum	Range
Stems per 100 square meters				
Woody Plants	5.1	47	0	47
Cactus	80.3	147	29	118
Mesic Mixed Grassland (Map Code 322)				
Stems per 100 square meters				
Woody Plants	11.8	196	0	196
Cactus	21.1	92	0	92
Reclaimed Grassland (Map Code 324)				
Stems per 100 square meters				
Woody Plants	1.9	16	0	16
Cactus	0.3	2	0	2
Disturbed Areas (Map Codes 410 through 500)				
Stems per 100 square meters				
Woody Plants	3.6	17	0	17
Cactus	0.1	1	0	1
Tall Upland Shrub (Map Code 230)				
Stems per 100 square meters				
Woody Plants	135.6	175	90	85
Cactus	0.2	1	0	1
Riparian Woodland (Map Code 110)				
Stems per 100 square meters				
Woody Plants	58.6	846	52	794
Cactus	13.2	51	0	51
Marsh (Map Codes 10 through 40)				
Stems per 100 square meters				
Woody Plants	2.1	15	0	15
Cactus	12.0	103	0	103

(1) From belt transect sampling data.

Table 4.3.2-2. Plant Species Occurrence by Community at Rocky Flats Plant, 1991 (1)

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HYDROLOGIC ZONE	XERIC	MESIC			HYDRIC		
COMMUNITY/ SUBCOMMUNITY	Xeric Mixed Grassland	Mesic Mixed Grassland		Tall Upland Shrub	Riparian Woodland		Marsh
		Reclaimed	Disturbed		Bot. Shrub		
SPECIES (2)							
TREES AND SHRUBS							
<i>Acer glabrum</i>				X			
<i>Amorpha fruticosa</i>					X	X	
<i>Berberis repens</i>				X			
<i>Clematis ligusticifolia</i>				X	X		
<i>Crataegus erythropoda</i>				X	X		
<i>Humulus lupulus</i>					X		
<i>Populus alba</i>					X		
<i>Populus angustifolia</i>					X		
<i>Populus deltoides</i>			X		X	X	X
<i>Prunus americana</i>							X
<i>Prunus virginiana</i>				X	X		
<i>Pseudotsuga menziesii</i>				X			
<i>Rhus aromatica</i>				X	X		
<i>Ribes odoratum</i>					X		
<i>Rosa acicularis</i>				X	X	X	X
<i>Rosa arkansana</i>	X	X	X				X
<i>Salix amygdaloides</i>					X	X	
<i>Salix exigua</i>			X		X		
<i>Salix ligulifolia</i>					X		
<i>Symphoricarpos occidentalis</i>		X	X	X	X	X	X
<i>Symphoricarpos sp.</i>			X				
<i>Ulmus pumila</i>					X		
<i>Yucca glauca</i>		X					
Total Woody Plant Species	1	2	2	4	9	5	5
CACTUS							
<i>Coryphantha missouriensis</i>	X	X					
<i>Echinocereus viridiflorus</i>	X	X					
<i>Opuntia fragilis</i>	X	X	X		X		
<i>Opuntia polyacantha</i>	X	X	X	X	X		
<i>Pediocactus simpsonii</i>		X			X		
Total Cactus Species	4	5	2	0	1	0	0
GRAMINOIDS							
<i>Agropyron caninum</i>		X		X	X	X	X
<i>Agropyron cristatum</i>		X	X	X			X
<i>Agropyron elongatum</i>			X	X			
<i>Agropyron intermedium</i>			X	X	X		X
<i>Agropyron repens</i>		X	X	X	X	X	X
<i>Agropyron smithii</i>	X	X	X	X	X	X	X
<i>Agropyron spicatum</i>					X		
<i>Agrostis hyemalis</i>					X		X
<i>Agrostis stolonifera</i>					X	X	X

Table 4.3.2-2. Plant Species Occurrence by Community at Rocky Flats Plant, 1991 (1)

HYDROLOGIC ZONE	XERIC	MESIC				HYDRIC		
COMMUNITY/ SUBCOMMUNITY	Xeric Mixed Grassland	Mesic Mixed Grassland			Tall Upland	Riparian Woodland		Marsh
			Reclaimed	Disturbed	Shrub		Bot. Shrub	
SPECIES (2)								
Alopecurus pratensis								X
Andropogon gerardii	X	X	X			X	X	
Andropogon scoparius	X	X	X	X				X
Aristida p. longiseta		X	X	X				
Aristida p. robusta	X							
Aristida sp.		X						
Bouteloua curtipendula	X	X						
Bouteloua gracilis	X	X	X		X	X		
Bromus inermis		X	X	X		X		X
Bromus japonicus	X	X	X	X	X	X		X
Bromus porteri		X				X		X
Bromus tectorum	X	X	X	X	X	X		X
Buchloe dactyloides	X	X				X		
Calamagrostis canadensis						X		X
Calamovilfa longifolia	X							
Carex bebbii								X
Carex eleocharis	X	X	X			X		
Carex filifolia	X	X				X	X	X
Carex hystericina						X		X
Carex interior								X
Carex lanuginosa						X		X
Carex nebraskensis		X				X		X
Carex praegracilis		X						X
Carex simulata						X		X
Carex sp.						X	X	X
Carex stipata						X		X
Dactylis glomerata			X			X		X
Danthonia spicata					X			X
Deschampsia cespitosa								X
Echinochloa crusgallii				X		X	X	X
Eleocharis acicularis								X
Eleocharis coloradoensis						X		X
Eleocharis compressa		X		X		X		
Eleocharis macrostachya						X		X
Elymus canadensis	X	X			X	X		
Festuca pratensis		X						X
Glyceria grandis						X		
Glyceria striata						X		X
Hordeum jubatum		X		X		X	X	X
Juncus balticus		X	X	X		X	X	X
Juncus confusus						X	X	
Juncus dudleyi		X	X	X		X		X

Table 4.3.2-2. Plant Species Occurrence by Community at Rocky Flats Plant, 1991 (1)

HYDROLOGIC ZONE	XERIC	MESIC			HYDRIC		
COMMUNITY/ SUBCOMMUNITY	Xeric Mixed Grassland	Mesic Mixed Grassland		Tall Upland Shrub	Riparian Woodland	Marsh	
		Reclaimed	Disturbed		Bot. Shrub		
SPECIES (2)							
<i>Juncus ensifolius</i>					X	X	
<i>Juncus noduosus</i>					X	X	
<i>Juncus sp.</i>					X		
<i>Juncus torreyi</i>					X	X	X
<i>Koeleria pyramidata</i>	X	X					X
<i>Muhlenbergia montana</i>	X						
<i>Muhlenbergia racemosa</i>		X			X		X
<i>Muhlenbergia torreyi</i>		X					
<i>Munroa squarrosa</i>			X				
<i>Panicum capillare</i>		X	X	X	X		X
<i>Panicum virgatum</i>					X	X	X
<i>Phleum pratense</i>		X			X		X
<i>Poa canbyi</i>	X						
<i>Poa compressa</i>	X	X	X	X	X	X	X
<i>Poa fendleriana</i>		X					
<i>Poa pratensis</i>	X	X	X	X	X	X	X
<i>Polypogon monspeliensis</i>			X				X
<i>Schedonnardus paniculatus</i>		X					
<i>Scirpus americanus</i>					X	X	X
<i>Scirpus pallidus</i>					X	X	X
<i>Scirpus validus</i>					X		
<i>Setaria glauca</i>			X				
<i>Setaria viridis</i>			X				X
<i>Sitanion hystrix</i>	X	X	X	X	X		
<i>Sorghastrum nutans</i>		X			X		X
<i>Spartina pectinata</i>						X	X
<i>Sporobolus cryptandrus</i>		X	X	X	X		X
<i>Sporobolus heterolepis</i>		X					X
<i>Stipa comata</i>	X	X	X		X		
<i>Stipa viridula</i>	X	X	X		X		X
<i>Typha angustifolia</i>			X		X	X	X
<i>Typha latifolia</i>			X		X	X	X
Total Graminoid Species	21	38	25	26	9	54	21
FORBS							
<i>Achillea millefolium</i>	X	X		X	X	X	X
<i>Agoseris glauca</i>	X	X			X		
<i>Agrimonia striata</i>					X		
<i>Alisma subcordatum</i>					X		X
<i>Allium textile</i>	X	X					
<i>Alyssum alyssoides</i>	X	X			X		
<i>Alyssum minus</i>	X	X	X	X	X		X
<i>Ambrosia artemisiifolia</i>		X	X				X

Table 4.3.2-2. Plant Species Occurrence by Community at Rocky Flats Plant, 1991 (1)

HYDROLOGIC ZONE	XERIC	MESIC			HYDRIC		
COMMUNITY/ SUBCOMMUNITY	Xeric Mixed Grassland	Mesic Mixed Grassland		Tall Upland	Riparian Woodland	Marsh	
		Reclaimed	Disturbed	Shrub	Bot. Shrub		
SPECIES (2)							
<i>Ambrosia psilostachya</i>	X	X	X	X	X	X	X
<i>Ambrosia trifida</i>					X		
<i>Anemone patens</i>		X					
<i>Antennaria parvifolia</i>	X						
<i>Apocynum cannabinum</i>		X			X		
<i>Arabis fendleri</i>		X			X		
<i>Arabis hirsuta</i>		X					
<i>Arabis sp.</i>							X
<i>Arctium minus</i>				X	X		
<i>Arenaria fendleri</i>	X						
<i>Argemone polyanthemus</i>			X	X			
<i>Arnica fulgens</i>	X	X			X		
<i>Artemisia campestris</i>	X	X	X		X		
<i>Artemisia dracunculus</i>	X	X			X		
<i>Artemisia frigida</i>	X	X	X		X		
<i>Artemisia ludoviciana</i>	X	X	X		X	X	X
<i>Asclepias incarnata</i>					X		X
<i>Asclepias pumila</i>		X					
<i>Asclepias speciosa</i>				X	X	X	X
<i>Asclepias viridiflora</i>	X	X	X	X	X		X
<i>Asparagus officinalis</i>				X			
<i>Aster ericoides</i>		X			X		X
<i>Aster falcatus</i>		X		X	X		X
<i>Aster laevis</i>					X		X
<i>Aster porteri</i>	X				X		X
<i>Astragalus adsurgens</i>		X			X		
<i>Astragalus agrestis</i>		X					
<i>Astragalus crassicaupus</i>			X				
<i>Astragalus drummondii</i>			X				
<i>Astragalus flexuosus</i>		X			X		
<i>Astragalus shortianus</i>		X					
<i>Astragalus spatulatus</i>					X	X	X
<i>Astragalus sp.</i>	X						
<i>Barbarea orthoceras</i>				X	X		X
<i>Bidens cernua</i>				X	X		X
<i>Calochortus gunnisonii</i>	X						
<i>Calstegia sepium</i>			X	X	X		
<i>Calylophus serrulatus</i>	X	X					
<i>Camelina microcarpa</i>		X	X		X		
<i>Capsella bursa-pastoris</i>					X		
<i>Carduus nutans</i>	X	X	X	X	X	X	X
<i>Castilleja sessiliflora</i>	X	X					

Table 4.3.2-2. Plant Species Occurrence by Community at Rocky Flats Plant, 1991 (1)

HYDROLOGIC ZONE	XERIC	MESIC			HYDRIC		
COMMUNITY/ SUBCOMMUNITY	Xeric Mixed Grassland	Mesic Mixed Grassland		Tall Upland Shrub	Riparian Woodland		Marsh
SPECIES (2)		Reclaimed	Disturbed		Bot. Shrub		
<i>Centaurea diffusa</i>	X	X	X	X	X		X
<i>Centaurea repens</i>		X	X	X	X		X
<i>Chenopodium album</i>			X	X	X		X
<i>Chenopodium botrys</i>			X				
<i>Chenopodium fremontii</i>				X			
<i>Chenopodium leptophyllum</i>		X	X	X	X		X
<i>Chrysopsis fulcrata</i>	X						
<i>Chrysopsis villosa</i>	X	X	X	X	X	X	
<i>Cicorium intybus</i>					X	X	
<i>Cicuta douglasii</i>					X		
<i>Cicuta maculata</i>							X
<i>Cirsium arvense</i>		X	X	X	X	X	X
<i>Cirsium sp.</i>						X	
<i>Cirsium undulatum</i>	X	X	X		X	X	X
<i>Collomia linearis</i>	X	X			X		X
<i>Comandra umbellata</i>	X	X					
<i>Conium maculatum</i>				X			X
<i>Conringia orientalis</i>					X		
<i>Convolvulus arvensis</i>		X	X	X	X		X
<i>Conyza canadensis</i>		X	X	X	X		X
<i>Crepis runcinata</i>	X	X					
<i>Croton texensis</i>		X			X		
<i>Cynoglossum officinale</i>			X		X		
<i>Dalea candida</i>		X			X		
<i>Dalea purpurea</i>	X	X					
<i>Delphinium nuttalianum</i>		X					
<i>Delphinium virescens</i>		X		X			X
<i>Descrurania pinnata</i>		X				X	
<i>Descrurania sophia</i>		X	X		X		
<i>Dyssodia papposa</i>		X	X	X	X		X
<i>Epilobium adenocaulon</i>					X		
<i>Epilobium ciliatum</i>					X		X
<i>Epilobium hornemanii</i>						X	X
<i>Equisetum arvense</i>					X		X
<i>Equisetum hyemale</i>				X		X	
<i>Equisetum laevigatum</i>				X	X		X
<i>Equisetum sp.</i>							X
<i>Erigeron divergens</i>		X	X				
<i>Erigeron flagellaris</i>	X	X			X		
<i>Erigeron pumilus</i>					X		
<i>Eriogonum alatum</i>	X	X					
<i>Erodium cicutarium</i>		X	X	X	X		

Table 4.3.2-2. Plant Species Occurrence by Community at Rocky Flats Plant, 1991 (1)

HYDROLOGIC ZONE	XERIC	MESIC			HYDRIC		
COMMUNITY/ SUBCOMMUNITY	Xeric Mixed Grassland	Mesic Mixed Grassland		Tall Upland Shrub	Riparian Woodland		Marsh
			Reclaimed		Disturbed		
SPECIES (2)							
Erysimum asperum	X	X			X		
Euphorbia marginata					X	X	
Euphorbia robusta		X					
Euphorbia serpyllifolia		X	X	X	X		
Evolvulus nuttallianus		X					X
Gaillardia aristata	X						
Galium aparine					X		X
Galium boreale		X			X		X
Galium sp.						X	
Galium triflorum				X		X	
Gaura coccinea	X	X	X			X	
Gaura parviflora					X		X
Geranium caespitosum				X	X		X
Geum aleppicum							
Glycyrrhiza lepidota				X	X	X	X
Grindelia squarrosa	X	X	X	X	X		X
Gutierrezia sarothrae	X	X	X	X	X		
Harbounia trachypleura	X						
Hedeoma drummondii							X
Hedeoma hispidum	X	X					
Helianthus annuus		X	X	X	X	X	X
Helianthus nuttallii					X		
Helianthus pumilus	X	X					
Heracleum sphondylium					X		
Hymenopappus filifolius	X						
Hypericum perforatum	X	X	X	X	X		X
Iris missouriensis							X
Kochia scoparia		X		X			
Kuhnia eupatorioides	X	X			X		
Lactuca oblongifolia					X		
Lactuca serriola	X	X	X	X	X	X	X
Lathyrus latifolius					X		
Lemna minor							X
Lepidium campestre		X					
Leucocnium montanum	X	X					
Liatris punctata	X						
Linaria dalmatica	X	X				X	X
Linaria vulgaris		X					
Linum perenne		X					
Lippia cuneifolia		X	X				
Lithospermum incisum		X					
Lomatium orientale	X	X		X		X	X

Table 4.3.2-2. Plant Species Occurrence by Community at Rocky Flats Plant, 1991 (1)

HYDROLOGIC ZONE	XERIC	MESIC			HYDRIC		
COMMUNITY/ SUBCOMMUNITY	Xeric Mixed Grassland	Mesic Mixed Grassland		Tall Upland	Riparian Woodland	Marsh	
		Reclaimed	Disturbed	Shrub	Bot. Shrub		
SPECIES (2)							
<i>Lupinus argenteus</i>					X		
<i>Lycopus americanum</i>					X	X	X
<i>Lythrum alatum</i>							X
<i>Marrubium vulgare</i>		X			X		
<i>Medicago lupulina</i>					X		X
<i>Melilotus alba</i>		X	X		X		X
<i>Melilotus officinalis</i>		X	X	X	X		X
<i>Mentha arvensis</i>					X	X	X
<i>Mertensia lanceolata</i>				X			
<i>Mirabilis hirsuta</i>					X		
<i>Mirabilis linearis</i>	X	X	X		X		
<i>Mirabilis nyctaginea</i>		X			X		
<i>Monarda fistulosa</i>				X	X	X	X
<i>Musineon divaricatum</i>					X		
<i>Nasturtium officinale</i>					X		X
<i>Nepeta cataria</i>				X	X	X	X
<i>Oenothera brachycarpa</i>						X	
<i>Oenothera flava</i>					X	X	X
<i>Onosmodium molle</i>	X	X	X	X	X		X
<i>Orobanche fasciculata</i>	X						
<i>Osmorhiza depauperata</i>				X			
<i>Oxalis dillenii</i>					X		X
<i>Oxytropis lambertii</i>	X						
<i>Paronychia jamesii</i>	X						
<i>Penstemon secundiflorus</i>	X				X		
<i>Phacelia heterophylla</i>	X	X	X		X		
<i>Physalis heterophylla</i>	X						
<i>Physalis virginiana</i>		X	X	X	X	X	
<i>Plantago lanceolata</i>		X		X	X	X	X
<i>Plantago major</i>					X		X
<i>Plantago patagonica</i>		X				X	
<i>Plantago sp.</i>							X
<i>Polygonum amphibium</i>							X
<i>Polygonum convolvulus</i>		X	X		X		
<i>Polygonum lapathifolium</i>			X		X		X
<i>Polygonum sawatchense</i>						X	X
<i>Polygonum sp.</i>							X
<i>Potentilla gracilis</i>	X	X					X
<i>Potentilla hippiana</i>					X		
<i>Prunella vulgaris</i>					X		X
<i>Psoralea tenuiflora</i>	X	X	X		X	X	X
<i>Ranunculus macounii</i>					X	X	X

Table 4.3.2-2. Plant Species Occurrence by Community at Rocky Flats Plant, 1991 (1)

HYDROLOGIC ZONE	XERIC	MESIC			HYDRIC		
COMMUNITY/ SUBCOMMUNITY	Xeric Mixed Grassland	Mesic Mixed Grassland		Tall Upland Shrub	Riparian Woodland	Marsh	
		Reclaimed	Disturbed		Bot. Shrub		
SPECIES (2)							
<i>Ratibida columnifera</i>		X			X		X
<i>Ratibida</i> sp.					X		
<i>Rorippa palustris</i>							X
<i>Rorippa sinuata</i>				X	X		X
<i>Rumex crispus</i>			X		X	X	X
<i>Rumex mexicanus</i>		X	X	X	X		X
<i>Rumex obtusifolius</i>				X			X
<i>Sagittaria cuneata</i>					X		
<i>Sagittaria latifolia</i>					X		
<i>Salsola iberica</i>		X	X				
<i>Salvia reflexa</i>			X				
<i>Scorzonera lanciniata</i>	X	X	X				
<i>Scrophularia lanceolata</i>					X		X
<i>Scutellaria brittonii</i>							X
<i>Sedum lanceolatum</i>	X						
<i>Selaginella densa</i>					X		X
<i>Senecio plattensis</i>	X	X					
<i>Senecio spartioides</i>	X	X	X	X	X		
<i>Silene antirrhina</i>		X					
<i>Silene</i> sp.					X		
<i>Sisymbrium altissimum</i>		X	X	X	X		X
<i>Smilacina racemosa</i>				X			
<i>Smilacina stellata</i>					X		
<i>Solidago missouriensis</i>				X	X	X	X
<i>Solidago mollis</i>					X		X
<i>Solidago nemoralis</i>	X						
<i>Sonchus a. arvensis</i>		X					X
<i>Sonchus a. uliginosus</i>		X	X				X
<i>Sphaeralcea coccinea</i>		X			X		
<i>Swerdia radiata</i>	X						
<i>Taraxacum officinale</i>		X	X	X	X	X	X
<i>Thermopsis divaricarpa</i>					X		X
<i>Thlaspi arvense</i>					X		X
<i>Toxicodendron rydbergii</i>				X	X	X	
<i>Tradescantia occidentalis</i>	X	X			X		
<i>Tragopogon dubius</i>	X	X	X	X	X		X
<i>Trifolium dubium</i>				X			
<i>Urtica dioica</i>				X			
<i>Vaccaria pyramidata</i>	X	X					
<i>Verbascum blattaria</i>		X	X		X	X	X
<i>Verbascum thapsus</i>		X	X	X	X	X	X
<i>Verbena bracteata</i>		X	X	X	X		X

Table 4.3.2-2. Plant Species Occurrence by Community at Rocky Flats Plant, 1991 (1)

HYDROLOGIC ZONE	XERIC	MESIC				HYDRIC		
COMMUNITY/ SUBCOMMUNITY	Xeric Mixed Grassland	Mesic Mixed Grassland		Tall Upland Shrub		Riparian Woodland		Marsh
		Reclaimed	Disturbed				Bot. Shrub	
SPECIES (2)								
Verbena hastata						X	X	X
Veronica americana						X		X
Veronica anagallis-aquatica				X		X		X
Vicia americana		X	X			X		
Viola canadensis						X		
Viola nephrophylla						X		X
Viola nuttallii		X			X			
Xanthium strumarium				X		X		X
Total Forb Species	65	104	50	49	38	135	42	100
TOTAL SPECIES PRESENT	91	149	79	79	57	208	68	162
TOTAL SPECIES BY ZONE	91	192				258		

(1) Information from data collected during belt transect surveys. This is a representative sampling only.

(2) For common names of listed plant species, refer to Appendix A.

X Indicates that the species is present in the community.

Table 4.3.2-3. Vegetation Cover Summaries by Community at Rocky Flats Plant, 1991 (1)

PERCENT	Mean	Maximum	Minimum	Range
Xeric Mixed Grassland (Map Code 323)				
Rock	8.2	16	3	13
Bare Ground	4.0	11	2	9
Litter	55.0	63	50	13
Vegetation	32.7	39	29	10
Mesic Mixed Grassland (Map Code 322)				
Rock	2.8	7	2	5
Bare Ground	2.4	7	0	7
Litter	58.6	76	50	26
Vegetation	33.1	42	21	21
Reclaimed Grassland (Map Code 324)				
Rock	2.8	11	0	11
Bare Ground	5.2	12	0	12
Litter	72.2	82	66	16
Vegetation	19.8	25	12	13
Disturbed Areas (Map Codes 410 through 500)				
Rock	6.7	31	0	31
Bare Ground	30.9	51	19	32
Litter	47.9	61	37	24
Vegetation	15.8	23	10	13
Tall Upland Shrub (Map Code 230)				
Rock	12.3	26	0	26
Bare Ground	11.3	19	7	12
Litter	58.8	79	51	28
Vegetation	16.6	36	7	29
Riparian Woodland (Map Code 110)				
Rock	12.7	38	0	38
Bare Ground	5.7	14	0	14
Litter	57.0	78	32	46
Vegetation	24.8	33	8	25
Bottomland Shrub (Map Code 210)				
Rock	12.8	35	6	29
Bare Ground	17.0	50	5	45
Litter	35.5	60	25	35
Vegetation	17.8	40	12	28
Marsh (Map Codes 10 through 40)				
Rock	4	38	0	38
Bare Ground	10	48	0	48
Litter	64	98	17	81
Vegetation	23	42	1	41

(1) Cover percent is based on ground cover contacted in 100 points, using the point-intercept sampling method.

Table 4.3.2-4. Terrestrial Arthropod Occurrence in Communities at Rocky Flats Plant, Summer 1991 (1)

Page 1 of 10

WATERSHED		WOMAN CREEK							WALNUT CREEK (2)		ROCK CREEK					
HYDROLOGIC ZONE		Xeric	Mesic			Hydric			Mesic		Xeric		Mesic		Hydric	
COMMUNITIES/ SUBCOMMUNITIES		XERIC	MESIC MIXED GRASSLAND			RIPARIAN WOODLAND		MARSH	MESIC MIXED GRASSLAND		XERIC MIXED GRASSLAND	PONDEROSA PINE WOODLAND	MESIC MIXED GRASSLAND	TALL UPLAND SHRUB	RIPARIAN WOODLAND	MARSH
		MIXED	RECLAIMED	DISTURBED	BOTTOMLAND											
		GRASSLAND	GRASSLAND	LAND	SHRUB											
TAXA	COMMON NAMES															
Class: CRUSTACEA																
Isopoda	PILLBUG			X												X
Class: DIPLOPODA																
Polydesmoidae	MILLIPEDE															X
Class: ARACHNIDA																
Acarinae	TICK															
Ixodidae								X								X
Araneae	SPIDERS															
Araneidae																
Araneus sp.																X
unk spider		X	X	X	X	X	X	X	X		X	X	X	X	X	X
Opiliones	DADDY-LONG-LEG															
Phalangidae			X		X	X	X	X						X	X	X
Solpugida	WIND-SCORPION															
Eremobatidae																X
Class: INSECTA																
Coleoptera	BEEETLES															
Anthicidae			X		X						X			X	X	
Buprestidae						X	X									
Agrilus sp.															X	
unk Buprestidae (3)														X	X	
Cantharidae																
Chauliognathus sp.		X	X	X	X	X		X	X		X					X
unk Cantharidae					X											
Carabidae								X							X	X

(1) Only plant communities indicated were sampled in the three drainages.

(2) Walnut Creek communities were sampled by sweep net only. Woman and Rock Creeks were sampled by sweep net and pit fall traps.

(3) unk (family name) = specimens only indentified to family level.

Table 4.3.2-4. Terrestrial Arthropod Occurrence in Communities at Rocky Flats Plant, Summer 1991 (1)

WATERSHED		WOMAN CREEK						WALNUT CREEK (2)	ROCK CREEK					
HYDROLOGIC ZONE		Xeric	Mesic			Hydric		Mesic	Xeric		Mesic		Hydric	
COMMUNITIES/ SUBCOMMUNITIES		XERIC MIXED GRASSLAND	MESIC MIXED GRASSLAND		RIPARIAN WOODLAND			MESIC MIXED GRASSLAND	XERIC MIXED GRASSLAND	PONDEROSA PINE WOODLAND	MESIC MIXED GRASSLAND	TALL UPLAND SHRUB	RIPARIAN WOODLAND	MARSH
			RECLAIMED GRASSLAND	DISTURBED LAND	BOTTOMLAND SHRUB	MARSH		DISTURBED LAND						
TAXA	COMMON NAMES													
Cerambycidae														
Megacyllene sp.					X									
Tetraopes sp.			X		X	X		X						
unk Cerambycidae						X								
Chrysomelidae														
Alticinae			X		X	X			X		X	X	X	X
Blepharia sp.										X				
Chlamisinae					X									
Chrysolina sp.					X									
Cryptocephalus sp.					X									
Diabrotica sp.					X	X	X	X	X				X	X
Disonycha sp.			X	X							X		X	X
Jonthonota sp.				X	X									X
Monoxia sp.								X						
Trivhabda sp.												X		
unk Chrysomelidae		X	X	X	X	X	X	X	X	X	X	X	X	X
Cleridae			X			X			X		X		X	
Coccinellidae														
Coccinella sp.		X	X		X	X		X	X	X	X	X	X	X
Hippodamia sp.		X	X		X			X	X		X		X	X
unk Coccinellidae		X	X	X	X	X		X	X		X		X	X
Curculionidae														
Hypera spp.					X									
Rhinocyllus sp.			X	X	X						X		X	
unk Curculionidae		X	X	X	X	X	X	X	X	X	X	X	X	X
Hydrophilidae						X								X

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Table 4.3.2-4. Terrestrial Arthropod Occurrence in Communities at Rocky Flats Plant, Summer 1991 (1)

WATERSHED		WOMAN CREEK						WALNUT CREEK (2)	ROCK CREEK					
HYDROLOGIC ZONE		Xeric	Mesic			Hydric		Mesic	Xeric		Mesic		Hydric	
COMMUNITIES/ SUBCOMMUNITIES		XERIC MIXED GRASSLAND	MESIC MIXED GRASSLAND		RIPARIAN WOODLAND		MARSH	MESIC MIXED GRASSLAND	XERIC MIXED GRASSLAND	PONDEROSA PINE WOODLAND	MESIC MIXED GRASSLAND	TALL UPLAND SHRUB	RIPARIAN WOODLAND	MARSH
			RECLAIMED GRASSLAND	DISTURBED LAND	BOTTOMLAND SHRUB			DISTURBED LAND						
TAXA	COMMON NAMES													
Lampyridae						X								X
Melandryidae			X			X			X			X	X	
Meloidae						X		X					X	X
Mordellidae				X							X	X		
Nitidulidae								X						
Phalacridae		X	X	X	X	X	X	X	X	X	X	X	X	X
Scaphidiidae														
Onthophagus sp.													X	
Trox sp.													X	
unk Scaphidiidae													X	
Silphidae														
Heterosilpha sp.						X							X	
Nicrophorus sp.													X	
Thanatophilus sp.													X	
Staphylinidae			X		X	X				X				
Dermoptera	EARWIGS													
Forficulidae														
Forficula sp.					X							X	X	X
Diptera	FLIES													
Acroceridae			X											
Agromyzidae			X	X	X	X	X	X	X	X	X	X	X	X
Anthomyiidae				X	X	X	X	X		X		X	X	X
Asilidae														X
Bombyliidae		X												
Calliphoridae			X		X	X	X						X	X
Cecidomyiidae			X											

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Table 4.3.2-4. Terrestrial Arthropod Occurrence in Communities at Rocky Flats Plant, Summer 1991 (1)

WATERSHED		WOMAN CREEK							WALNUT CREEK (2)	ROCK CREEK						
HYDROLOGIC ZONE		Xeric	Mesic			Hydric			Mesic	Xeric		Mesic		Hydric		
COMMUNITIES/ SUBCOMMUNITIES		XERIC	MESIC MIXED GRASSLAND			RIPARIAN WOODLAND		MARSH	MESIC MIXED GRASSLAND	XERIC	PONDEROSA	MESIC	TALL	RIPARIAN	MARSH	
		MIXED	RECLAIMED	DISTURBED	BOTTOMLAND	DISTURBED	MIXED		PINE	MIXED	UPLAND	WOODLAND				
		GRASSLAND	GRASSLAND	LAND	SHRUB	LAND	GRASSLAND		WOODLAND	GRASSLAND	SHRUB					
TAXA	COMMON NAMES															
Ceratopogonidae			X			X						X		X		
Chironomidae			X X			X	X	X	X	X	X	X	X		X	
Chloropidae		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Conopidae									X					X X		
Culicidae						X										
Dolichopodidae		X	X			X	X				X	X		X	X	
Empididae						X					X					
Ephydriidae						X	X	X	X	X	X	X	X	X	X	X
Heleomyzidae												X		X		
Hippoboscidae												X				
Lauxaniidae						X						X		X	X	
Micropezidae						X										
Muscidae						X	X	X			X	X		X	X	
Mycetophilidae						X										
Otitidae											X			X	X	
Phoridae			X						X			X		X		
Pipunculidae			X	X	X	X	X			X	X	X			X	X
Rhagionidae										X					X	
Richardiidae															X	
Sarcophagidae											X					
Sciaridae											X	X		X	X	
Sciomyzidae						X	X	X				X		X	X	
Sepsidae			X	X		X	X	X			X	X		X	X	
Simuliidae												X				
Stratiomyidae						X										
Syrphidae			X	X		X	X		X					X		

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Table 4.3.2-4. Terrestrial Arthropod Occurrence in Communities at Rocky Flats Plant, Summer 1991 (1)

WATERSHED		WOMAN CREEK							WALNUT CREEK (2)	ROCK CREEK						
HYDROLOGIC ZONE		Xeric	Mesic			Hydric			Mesic	Xeric		Mesic		Hydric		
COMMUNITIES/ SUBCOMMUNITIES		XERIC	MESIC MIXED GRASSLAND			RIPARIAN WOODLAND		MARSH	MESIC MIXED GRASSLAND	XERIC	PONDEROSA	MESIC	TALL	RIPARIAN	MARSH	
		MIXED	RECLAIMED GRASSLAND	DISTURBED LAND	BOTTOMLAND SHRUB	DISTURBED	MIXED		PINE	MIXED	UPLAND	WOODLAND				
		GRASSLAND				LAND	SHRUB		GRASSLAND	WOODLAND	GRASSLAND	SHRUB	WOODLAND			
TAXA	COMMON NAMES															
Tabanidae																
Chrysops sp.						X								X		
Tachinidae			X	X	X	X	X	X	X	X	X	X	X	X	X	
Tephritidae			X	X	X	X	X	X	X	X	X	X	X	X	X	
Therevidae			X			X										
Tipulidae						X			X				X	X	X	
Ephemeroptera	MAYFLIES															
Baetidae																
Baetis sp.			X													
Caelobaetis sp.						X										
Callibaetis sp.																
unk Baetidae						X				X					X	
Hemiptera	TRUE BUGS															
Alydidae																
Alydus sp.						X									X	
Megalotomus sp.						X	X								X	
unk Alydidae						X	X								X	
Anthocoridae			X	X				X	X	X	X	X	X	X	X	
Berytidae																
Jalysius sp.			X							X	X			X	X	
unk Berytidae									X					X		
Coreidae		X				X					X			X		
Lygaeidae																
Lygaeus sp.			X						X					X		
unk Lygaeidae		X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Miridae		X	X	X	X	X	X	X	X	X	X	X	X	X	X	

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WATERSHED		WOMAN CREEK							WALNUT CREEK (2)	ROCK CREEK					
HYDROLOGIC ZONE		Xeric	Mesic			Hydric			Mesic	Xeric		Mesic		Hydric	
COMMUNITIES/ SUBCOMMUNITIES		XERIC MIXED GRASSLAND	MESIC MIXED GRASSLAND		RIPARIAN WOODLAND	BOTOMLAND		MARSH	MESIC MIXED GRASSLAND	XERIC MIXED GRASSLAND	PONDEROSA PINE WOODLAND	MESIC MIXED GRASSLAND	TALL UPLAND SHRUB	RIPARIAN WOODLAND	MARSH
TAXA			RECLAIMED GRASSLAND	DISTURBED LAND		SHRUB	DISTURBED LAND								
COMMON NAMES															
Nabidae															
Nabidula sp.					X										
Nabis sp.		X	X	X	X	X	X	X	X	X	X	X	X	X	X
Pentatomidae															
Podisus sp.					X										
unk Pentatomidae		X	X	X		X	X	X	X	X	X	X	X	X	X
Reduviidae															
Phymata sp.			X			X		X	X	X		X			
Sinea sp.			X	X		X	X	X	X	X		X		X	X
unk Reduviidae			X	X		X		X	X			X	X		X
Rhopalidae											X				
Scutelleridae															
Homaemus sp.			X							X	X	X		X	
unk Scutelleridae			X	X	X		X	X	X	X	X	X	X		X
Thyreocoridae															
Corimelaena sp.												X			
unk Thyreocoridae			X							X		X			
Tingidae			X	X		X		X	X	X	X		X	X	X
Homoptera	APHIDS/														
Aphididae	SCALE INSECTS/		X	X	X	X	X	X	X	X	X	X	X	X	X
Cercopidae	LEAFHOPPERS		X	X	X	X	X	X	X	X	X	X	X	X	X
Cicadellidae															
Dorycephalus sp.												X			
Oncometopia sp.		X	X	X	X	X	X	X	X	X	X	X		X	X
unk Cicadellidae		X	X	X	X	X	X	X	X	X	X	X	X	X	X
Cixiidae						X		X							

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Table 4.3.2-4. Terrestrial Arthropod Occurrence in Communities at Rocky Flats Plant, Summer 1991 (1)

WATERSHED		WOMAN CREEK							WALNUT CREEK (2)	ROCK CREEK					
HYDROLOGIC ZONE		Xeric	Mesic				Hydric		Mesic	Xeric		Mesic		Hydric	
COMMUNITIES/ SUBCOMMUNITIES		XERIC MIXED GRASSLAND	MESIC MIXED GRASSLAND		RIPARIAN WOODLAND		MARSH		MESIC MIXED GRASSLAND	XERIC MIXED GRASSLAND	PONDEROSA PINE WOODLAND	MESIC MIXED GRASSLAND	TALL UPLAND SHRUB	RIPARIAN WOODLAND	MARSH
			RECLAIMED GRASSLAND	DISTURBED LAND	BOTTOMLAND SHRUB				DISTURBED LAND						
TAXA	COMMON NAMES														
Delphacidae		X	X	X	X	X	X	X		X		X		X	X
Dictyopharidae		X	X	X	X	X	X	X	X			X			X
Issidae						X	X	X			X	X		X	X
Membracidae															
Publilia sp.			X												X
Stictiocephala sp.			X			X		X				X	X	X	X
unk Membracidae			X	X	X	X	X	X	X	X	X		X	X	X
Psyllidae				X		X							X	X	X
Hymenoptera	ANTS/WASPS/BEES														
Andrenidae								X	X						
Anthophoridae						X	X		X						
Apidae															
Apis sp.				X		X	X		X				X		X
Bombus sp.															X
Bethylidae					X						X		X		X
Braconidae											X				
Chelonus sp.									X						
unk Braconidae		X	X	X	X	X	X	X	X	X		X	X	X	X
Chalcidoidae			X	X	X	X	X	X	X	X	X	X	X	X	X
Chrysididae														X	
Colletidae															
Hylaeus sp.					X	X	X						X	X	X
Formicidae															
Camponotus sp.															X
unk Formicidae		X	X	X	X	X	X	X	X	X	X	X	X	X	X
Halictidae															
Sphecodes sp.														X	

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Table 4.3.2-4. Terrestrial Arthropod Occurrence in Communities at Rocky Flats Plant, Summer 1991 (1)

WATERSHED		WOMAN CREEK						WALNUT CREEK (2)		ROCK CREEK					
HYDROLOGIC ZONE		Xeric	Mesic			Hydric			Mesic	Xeric		Mesic		Hydric	
COMMUNITIES/ SUBCOMMUNITIES		XERIC MIXED GRASSLAND	MESIC MIXED GRASSLAND		DISTURBED LAND	RIPARIAN WOODLAND		MARSH	MESIC MIXED GRASSLAND	XERIC MIXED GRASSLAND	PONDEROSA PINE WOODLAND	MESIC MIXED GRASSLAND	TALL UPLAND SHRUB	RIPARIAN WOODLAND	MARSH
			RECLAIMED GRASSLAND			BOTTOMLAND SHRUB			RESTORED LAND						
TAXA	COMMON NAMES														
unk Halictidae		X	X	X	X	X	X	X	X	X		X	X	X	X
Ichneumonidae				X		X	X			X	X		X	X	X
Scelionidae														X	
Sphecidae															X
Tenthredinidae															X
Tiphiidae		X		X	X										
Vespidae															
Dolichovespula sp.								X							
unk Vespidae			X						X			X			
Lepidoptera	BUTTERFLIES/ MOTHS														
Arctiidae						X		X							
Danaidae															
Danaus sp.							X								
Geometridae			X	X	X	X	X			X	X			X	
Noctuidae			X	X	X	X	X		X		X			X	X
Nymphalidae															
Phyciodes sp.														X	
Pieridae						X			X						
Pterophoridae															X
Pyralidae			X			X			X	X		X			X
Saturniidae															
Automeris sp.						X	X								
Tortricidae				X		X		X	X	X		X	X	X	
Neuroptera	LACEWINGS/ ANTLIONS														
Chloropidae						X									
Chrysopidae			X			X	X	X	X				X	X	X

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WATERSHED		WOMAN CREEK						WALNUT CREEK (2)	ROCK CREEK					
HYDROLOGIC ZONE		Xeric	Mesic			Hydric		Mesic	Xeric		Mesic		Hydric	
COMMUNITIES/ SUBCOMMUNITIES		XERIC MIXED GRASSLAND	MESIC MIXED GRASSLAND		RIPARIAN WOODLAND			MESIC MIXED GRASSLAND	XERIC MIXED GRASSLAND	PONDEROSA PINE WOODLAND	MESIC MIXED GRASSLAND	TALL UPLAND SHRUB	RIPARIAN WOODLAND	MARSH
			RECLAIMED GRASSLAND	DISTURBED LAND	BOTTOMLAND SHRUB	MARSH		DISTURBED LAND						
TAXA	COMMON NAMES													
Hemeroptera					X	X								
Myrmeleontidae												X		
Odonata	DRAGONFLIES/													
Coenagrionidae	DAMSELFLIES													
Ichanra sp.										X				
Enallagma sp.						X							X	
Orthoptera	GRASSHOPPERS/													
Acrididae	CRICKETS/MANTIDS													
Acrolophitus sp.			X											
Amphitornus sp.			X		X	X	X		X					
Dissosteira sp.			X	X			X						X	
Melanoplus sp.			X	X	X	X	X	X	X	X	X	X	X	X
Mermiria sp.			X											
Gryllidae														
Oecanthus sp.			X	X	X	X	X	X	X	X	X	X	X	X
Mantidae														
Yersiniops sp.											X			
Tettigoniidae														
Conocephalus sp.			X	X	X	X	X				X		X	X
Scudderia sp.						X	X						X	X
Psocoptera	BARKLICE													
Psocidae			X	X		X	X						X	
Thysanoptera	THRIPS													
Thripidae					X								X	X

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Table 4.3.2-4. Terrestrial Arthropod Occurrence in Communities at Rocky Flats Plant, Summer 1991 (1)

WATERSHED		WOMAN CREEK							WALNUT CREEK (2)	ROCK CREEK						
HYDROLOGIC ZONE		Xeric	Mesic				Hydric			Mesic	Xeric		Mesic		Hydric	
COMMUNITIES/ SUBCOMMUNITIES		XERIC	MESIC MIXED GRASSLAND				RIPARIAN WOODLAND			MESIC MIXED GRASSLAND	XERIC	PONDEROSA	MESIC	TALL	RIPARIAN	
		MIXED	RECLAIMED	DISTURBED			BOTTOMLAND	MARSH	DISTURBED	MIXED	PINE	MIXED	UPLAND	WOODLAND	MARSH	
		GRASSLAND	GRASSLAND	LAND			SHRUB		LAND	GRASSLAND	WOODLAND	GRASSLAND	SHRUB			
TAXA	COMMON NAMES															
Trichoptera	CADDIS FLIES															
Hydropsychidae																
Cheumatopsyche sp.							X									
Total Taxa:																
Habitat		24	65	52	47	88	58	81	57	48	47	48	58	90	91	
Community Type		24	84			96			57	66		78		120		
Hydrologic Type		24	84			107			57	66		78		120		
Watershed		134							57	136						
TOTAL NUMBER OF TAXA AT RFP = 175																

(1) Only plant communities indicated were sampled in the three drainages.

(2) Walnut Creek communities were sampled by sweep net only. Woman and Rock Creeks were sampled by sweep net and pit fall traps.

(3) unk (family name) = specimens only identified to family level.

Table 4.3.2-5. Relative Abundance of Terrestrial Arthropods in Habitats at Rocky Flats Plant, 1991

Habitat	Orders (1)	Families	Number of Individuals (2)
Xeric Mixed Grassland	8	49	842
Mesic Mixed Grassland	11	57	1678
Reclaimed Grassland	10	50	527
Disturbed Areas	11	63	1034
Shrubland	11	71	1357
Woodland	17	97	4105
Marshland	18	91	1826
TOTAL DIFFERENT TAXA AT RFP =	20	124	

(1) Totals for insect orders and families were derived from a listing for each habitat type.

(2) Number of individuals is the total number of separate identifications for all orders in each habitat type.

Note: All results are from sweep netting only.

Table 4.3.2-6. Reptile Species Distribution by Habitat at Rocky Flats Plant, 1991

Species		Resident Status at RFP (1)	Habitat				
Common Name	Scientific Name		Grassland	Disturbed	Shrubland	Woodland	Marshland
TURTLES		CHELYRIDAE					
Western Painted Turtle	<i>Chrysemys picta</i>	Common		X			X
LIZARDS		IGUANIDAE					
Short-horned Lizard	<i>Phrynosoma douglassi</i>	Infrequent	X				
Eastern Fence Lizard	<i>Sceloporus undulatus</i>	Infrequent		X			
COLUBRIDS		COLUBRIDAE					
Racer	<i>Coluber constrictor</i>	Uncommon	X			X	
Bull Snake	<i>Pituophis melanoleucus</i>	Common	X	X	X	X	X
Plains Garter Snake	<i>Thamnophis radix</i>	Frequent	X			X	X
Common Garter Snake	<i>Thamnophis sirtalis</i>	Infrequent					
VIPERS		VIRERIDAE					
Prairie Rattlesnake	<i>Crotalis viridis</i>	Frequent	X		X		X
Total Number of Species by Habitat			5	3	2	3	4

(1) Status Definitions

Common: Observed over half of the time.

Frequent: Observed often, but less than half of the time.

Uncommon: Observed regularly, but not frequently.

X = Occurs in this habitat.

Infrequent: Observed occasionally.

Rare: Observed less than annually.

Table 4.3.2-7. Summary of Amphibians and Reptiles Observed During Relative Abundance Surveys at RFP, 1991

SPRING (1)											
HABITAT (Hours in Habitat)	GRASSLAND (26.9 Hours)		DISTURBED (7.6 Hours)		SHRUBLAND (15.1 Hours)		WOODLAND (15.7 Hours)		MARSHLAND (20.4 Hours)		TOTAL (85.7 Hours)
Species	Number	No./Hr.	Number	No./Hr.	Number	No./Hr.	Number	No./Hr.	Number	No./Hr.	Number No./Hr.
Amphibians											
Woodhouse's Toad	1	0.0		0.0		0.0		0.0		0.0	1 0.0
Boreal Chorus Frog		0.0		0.0		0.0		0.0	36	1.8	36 0.4
Northern Leopard Frog		0.0		0.0	2	0.1		0.0	5	0.2	7 0.1
Reptiles											
W. Painted Turtle		0.0	4	0.5		0.0		0.0	33	1.6	37 0.4
Eastern Fence Lizard		0.0	1	0.1		0.0		0.0		0.0	1 0.0
Racer		0.0		0.0		0.0	1	0.1		0.0	1 0.0
Bullsnake	1	0.0	1	0.1		0.0	1	0.1	1	0.0	4 0.0
Plains Garter Snake		0.0		0.0		0.0		0.0	1	0.0	1 0.0
Prairie Rattlesnake	1	0.0		0.0		0.0		0.0		0.0	1 0.0
No. of Species Present	3		3		1		2		5		9
SUMMER (2)											
HABITAT (Hours in Habitat)	GRASSLAND (16.0 Hours)		DISTURBED (2.9 Hours)		SHRUBLAND (8.2 Hours)		WOODLAND (10.9 Hours)		MARSHLAND (10.4 Hours)		TOTAL (48.4 Hours)
Species	Number	No./Hr.	Number	No./Hr.	Number	No./Hr.	Number	No./Hr.	Number	No./Hr.	Number No./Hr.
Amphibians											
Northern Leopard Frog		0.0		0.0		0.0		0.0	9	0.9	9 0.2
Reptiles											
W. Painted Turtle		0.0		0.0		0.0		0.0	33	3.2	33 0.7
Bullsnake	1	0.1	1	0.3		0.0		0.0		0.0	2 0.0
No. of Species Present	1		1		0		0		2		3

(1) April, May, June

(2) July, August, September

Table 4.3.2-8. Bird Species Distribution by Habitat at Rocky Flats Plant, 1991-1992 (1)

Species		Rel. Abund. by Season				ANIMAL HABITATS					Species Breeding Status	Species Average Arrival
Common Name	Scientific Name	Sp	Su	Fa	Wi	GRA	DIS	SHR	WOD	MAR		
GREBES	PODICIPEDIDAE											
Pied-billed Grebe	Podilymbus podiceps	U	U	U						X	Suspected	15-Mar
CORMORANTS	PHALACROCORACIDAE											
Double-crested Cormorant	Phalacrocorax auritus	O	U	O			X			X		1-Apr
HERONS	ARDEIDAE											
Great Blue Heron	Ardea herodias	U	C	U		X		X	X	X		YR 1
Green-backed Heron	Butorides striatus	O								X		21-Apr
Black-crowned Night-heron	Nycticorax nycticorax	U	C				X	X	X	X		1-Apr
GEESE AND DUCKS	ANATIDAE											
Canada Goose	Branta canadensis	U	U	U		X				X	Confirmed	YR 2
Snow Goose	Chen caerulescens			U		X				X		23-Sep
Mallard	Anas platyrhynchos	A	A	C	C	X	X	X	X	X	Confirmed	YR
Gadwall	Anas strepera	U	U	U						X		YR 2
Northern Pintail	Anas acuta	O	O							X		YR M
Green-winged Teal	Anas crecca	C	U	O	U					X		YR M
Blue-winged Teal	Anas discors	C	O	C						X		15-Mar
Cinnamon Teal	Anas cyanoptera	C	O							X		15-Mar
Northern Shoveler	Anas clypeata	U	U							X		YR 2
Redhead	Aythya americana				U					X		YR M
Ring-necked Duck	Aythya collaris	U								X		15-Sep
Canvasback	Aythya valisineria				U					X		21-Feb
Lesser Scaup	Aythya affinis	C		U	U					X		YR M
Common Goldeneye	Bucephala clangula	U		U	U					X		21-Oct
Bufflehead	Bucephala albeola	U	C				X		X	X		1-Jan
Hooded Merganser	Lophodytes cucullatus	O								X		1-Apr
Common Merganser	Mergus merganser	U		O						X		YR 2
AMERICAN VULTURES	CATHARTIDAE											
Turkey Vulture	Cathartes aura	O	O	O		X	X	X	X	X		1-Mar
EAGLES AND HAWKS	ACCIPITRIDAE											
Sharp-shinned Hawk	Accipiter striatus	U				X	X	X	X			YR
Cooper's Hawk	Accipiter cooperii		O			X						YR
Red-tailed Hawk	Buteo jamaicensis	C	U	U	O	X	X	X	X	X	Confirmed	YR
Swainson's Hawk	Buteo swainsoni	U	U	O		X		X	X	X	Confirmed	15-Mar
Rough-legged Hawk	Buteo lagopus			O	O	X	X		X	X		15-Sep
Ferruginous Hawk	Buteo regalis	O	O	O	O	X	X	X	X	X		YR
Golden Eagle	Aquila chrysaetos	O	O		O	X	X		X	X		YR
Bald Eagle	Haliaeetus leucocephalus				O	X				X		1-Nov
Northern Harrier	Circus cyaneus	U	U	U	U	X	X	X	X	X		YR 1
FALCONS	FALCONIDAE											
Prairie Falcon	Falco mexicanus	O		O	O	X	X		X			YR
Peregrine Falcon	Falco peregrinus			R		X						15-Apr, 1-Sep
Merlin	Falco columbarius				R				X			21-Mar, 21-Sep

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Species		Rel. Abund. by Season				ANIMAL HABITATS					Species Breeding Status	Species Average Arrival
Common Name	Scientific Name	Sp	Su	Fa	Wi	GRA	DIS	SHR	WOD	MAR		
American Kestrel	Falco sparverius	O	O	U	O	X	X	X	X	X		YR 1
GROUSE AND TURKEYS		PHASIANIDAE										
Ring-necked Pheasant	Phasianus colchicus	O	O	O	O	X		X	X	X	Suspected	YR
Wild Turkey	Meleagris gallopavo	O				X						YR
RAILS AND COOTS		RALLIDAE										
Virginia Rail	Rallus limicola	U								X	Suspected	15-Apr
Sora Rail	Porzana carolina		U							X	Suspected	1-May
American coot	Fulica americana	U	U	U		X			X	X	Suspected	YR 1
CRANES		GRUIDAE										
Sandhill Crane	Grus canadensis			U		X				X		15-Mar, 15-Sep
PLOVERS		CHARADRIIDAE										
Killdeer	Charadrius vociferus	C	C	U		X	X	X	X	X	Confirmed	YR 1
SANDPIPERS AND ALLIES		SCOLOPACIDAE										
Lesser Yellowlegs	Tringa flavipes	O	O							X		1-Apr, 21-Jul
Solitary Sandpiper	Tringa solitaria	U								X		21-Apr, 15-Jul
Willet	Catoptrophorus semipalmatu	U	O							X		21-Apr
Spotted Sandpiper	Actitis macularia	C	U							X		15-Apr
Long-billed Dowitcher	Limnodromus scolopaceus	O								X		15-Apr, 21-Jul
Common Snipe	Gallinago gallinago	U	U	U				X	X	X	Confirmed	YR M
Pectoral Sandpiper	Calidris melanotos	O								X		15-Apr, 15-Aug
PIGEONS AND DOVES		COLUMBIDAE										
Band-tailed Pigeon	Columba fasciata		O			X					Confirmed	21-Apr
Rock Dove	Columba livia	C	C	C	C	X	X		X	X	Confirmed	YR
Mourning Dove	Zenaida macroura	C	C	C		X	X	X	X	X	Confirmed	YR 1
OWLS		STRIGIDAE										
Great Horned Owl	Bubo virginianus	C	C	C	C	X	X	X	X	X	Confirmed	YR
Long-eared Owl	Asio otus			O					X			YR
Short-eared Owl	Asio flammeus	O		O	O	X		X				21-Nov
GULLS		LARIDAE										
Ring-billed Gull	Larus delawarensis	C	O	O	O	X		X				YR 2
NIGHT JARS		CAPRIMULGIDAE										
Common Nighthawk	Chordeiles minor	U	U			X	X		X	X	Confirmed	15-May
HUMMINGBIRDS		TROCHILIDAE										
Broad-tailed Hummingbird	Selasphorus platycercus		O			X						21-Apr
Rufous Hummingbird	Selasphorus rufus		O					X				7-Jul
KINGFISHERS		ALCEDINIDAE										
Belted Kingfisher	Ceryle alcyon	U	U	U					X	X		YR
WOODPECKERS		PICIDAE										
Northern Flicker	Colaptes auratus	U	U	C	C	X	X	X	X		Suspected	YR
Red-naped Sapsucker	Sphyrapicus nuchalis			O					X			21-Apr
Hairy Woodpecker	Picoides villosus			O					X			YR
Downy Woodpecker	Picoides pubescens			O	O				X		Suspected	YR

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Common Name	Scientific Name	Sp	Su	Fa	Wi	GRA	DIS	SHR	WOD	MAR		
TYRANT FLYCATCHERS		TYRANNIDAE										
Eastern Kingbird	<i>Tyrannus tyrannus</i>	O	C			X		X	X	X	Confirmed	1-May
Western Kingbird	<i>Tyrannus verticalis</i>	C	C	U		X	X		X	X	Confirmed	15-Apr
Eastern Phoebe	<i>Sayornis phoebe</i>	R							X			1-May
Say's Phoebe	<i>Sayornis saya</i>	C	C	U		X	X	X	X	X	Confirmed	7-Apr
Willow Flycatcher	<i>Empidonax traillii</i>	U							X			1-May
Hammond's Flycatcher	<i>Empidonax hammondi</i>	U							X			1-May
Dusky Flycatcher	<i>Empidonax oberholseri</i>	U		O					X	X		21-Apr
Western Flycatcher	<i>Empidonax difficilis</i>	U		O				X	X			21-Apr
Western Wood-Pewee	<i>Contopus sordidulus</i>	U	U	O		X		X	X			7-May
Olive-sided Flycatcher	<i>Contopus borealis</i>			O					X			7-May
LARKS		ALAUDIDAE										
Horned Lark	<i>Eremophila alpestris</i>	U	O	U	U	X	X	X	X	X	Confirmed	YR 2
SWALLOWS		HIRUNDINIDAE										
Violet-green Swallow	<i>Tachycineta thalassina</i>	C	U			X		X	X	X	Suspected	1-Apr
Tree Swallow	<i>Tachycineta bicolor</i>	C	C	O		X		X	X	X	Suspected	15-Mar
Northern Rough-winged Swallow	<i>Steigodopteryx serripennis</i>	U				X				X		1-Apr
Barn Swallow	<i>Hirundo rustica</i>	C	A	U		X	X	X	X	X	Confirmed	1-Apr
Cliff Swallow	<i>Hirundo pyrrhonota</i>	U	C	U		X	X	X	X	X	Suspected	15-Apr
CROWS, JAYS, MAGPIES		CORVIDAE										
Blue Jay	<i>Cyanocitta cristata</i>			U		X			X	X		YR
Black-billed Magpie	<i>Pica pica</i>	C	C	C	C	X	X	X	X	X	Confirmed	YR
Common Raven	<i>Corvus corax</i>	U	O	O	U	X	X	X	X	X		YR
American Crow	<i>Corvus brachyrhynchos</i>			O	O	X				X		YR
Pinyon Jay	<i>Gymnorhinus cyanocephalus</i>		O						X			YR
TITMICE		PARIDAE										
Black-capped Chickadee	<i>Parus atricapillus</i>	O		O					X		Suspected	YR
NUTHATCHES		SITIDAE										
White-breasted Nuthatch	<i>Sitta carolinensis</i>	U							X			YR
WRENS		TROGLODYTIDAE										
House Wren	<i>Troglodytes aedon</i>	U	O	O		X		X	X			21-Apr
Winter Wren	<i>Troglodytes troglodytes</i>			R				X				7-Oct
Marsh Wren	<i>Cistothorus palustris</i>	U		U			X			X	Suspected	1-Apr
Rock Wren	<i>Salpinctes obsoletus</i>	C	C	U		X	X		X	X		YR 1
MUSCICAPIDS		MUSCICAPIDAE										
Ruby-crowned Kinglet	<i>Regulus calendula</i>			C					X			1-Apr, 7-Sep
Mountain Bluebird	<i>Sialia currucoides</i>			U		X						15-Jan
Townsend's Solitaire	<i>Myadestes townsendi</i>	U			O				X	X		YR 1
Swainson's Thrush	<i>Catharus ustulatus</i>		U					X				1-May
American Robin	<i>Turdus migratorius</i>	C	C	U	O	X		X	X	X	Confirmed	YR 1
THRASHERS		MIMIDAE										
Gray Catbird	<i>Dumetella carolinensis</i>	U	U					X			Suspected	7-Apr

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Common Name	Scientific Name	Sp	Su	Fa	Wi	GRA	DIS	SHR	WOD	MAR		
Sage Thrasher	Oreoscoptes montanus		U	U		X	X	X	X			1-Apr
SHRIKES	LANIIDAE											
Loggerhead Shrike	Lanius ludovicianus	U	O	O	O		X	X	X	X	Suspected	1-Mar
Northern Shrike	Lanius excubitor				O				X			7-Oct
STARLINGS	STURNIDAE											
European Starling	Sturnus vulgaris	C	A	C	U	X	X	X	X	X	Confirmed	YR
VIREOS	VIREONIDAE											
Solitary Vireo	Vireo solitarius			O					X			15-May
Warbling Vireo	Vireo gilvus	U	U						X		Suspected	1-May
WOOD WARBLERS	PARULINAE											
Yellow Warbler	Dendroica petechia	C	C	C		X		X	X	X	Confirmed	1-May
Yellow-rumped Warbler	Dendroica coronata	C		C					X			15-Apr
Townsend's Warbler	Dendroica townsendi			O						X		15-Apr, 21-Aug
MacGillivray's Warbler	Opornis tolmiei			U		X		X	X	X		21-Apr
Common Yellowthroat	Geothlypis trichas	U	C	C		X		X	X	X	Confirmed	15-Apr
Yellow-breasted Chat	Icteria virens	U						X	X		Suspected	7-May
Wilson's Warbler	Wilsonia pusilla			U				X	X	X		15-Apr
TANAGERS	THRAUPINAE											
Western Tanager	Piranga ludoviciana	U		U					X			7-May
GROSBEAKS AND ALLIES	CARDINALINAE											
Black-headed Grosbeak	Phaeothlypis melanocephalus			O					X			7-May
Blue Grosbeak	Guiraca caerulea	U	C	U		X		X	X		Confirmed	15-May
Indigo Bunting	Passerina cyanea	O	O						X			15-May
Lazuli Bunting	Passerina amoena	O	O					X	X			1-May
TOWHEES AND SPARROWS	EMBERIZINAE											
Green-tailed Towhee	Pipilo chlorurus	U	U	O				X	X		Suspected	1-May
Rufous-sided Towhee	Pipilo erythrophthalmus	C	C	C		X	X	X	X	X	Confirmed	1-Apr
Grasshopper Sparrow	Ammodramus savannarum	U	C	U		X	X	X		X	Confirmed	15-May
Vesper Sparrow	Poocetes gramineus	A	A	C		X	X	X	X	X	Confirmed	15-Apr
Savannah Sparrow	Passerculus sandwichensis	U	O	O		X	X	X		X		15-Apr
Song Sparrow	Melospiza melodia	C	C	C	U	X	X	X	X	X	Confirmed	YR
Lark sparrow	Chondestes grammacus		O	O				X		X	Suspected	21-Apr
American Tree Sparrow	Spizella arborea	U		U	C	X	X	X	X	X		15-Oct
Chipping Sparrow	Spizella passerina	U	U	C	O	X	X	X	X	X		15-Apr
Clay-colored Sparrow	Spizella pallida			U		X			X	X		21-Apr, 21-Aug
Brewer's Sparrow	Spizella breweri			C		X		X				21-Apr
Dark-eyed Junco	Junco hyemalis	U		U	O	X		X	X			YR
Harris's Sparrow	Zonotrichia querula				R				X			15-Oct
White-crowned Sparrow	Zonotrichia leucophrys	C		C		X		X	X			YR 2
Lincoln's Sparrow	Melospiza lincolni	U		U					X	X		1-Apr
Lapland Longspur	Calcarius lapponicus				O	X						7-Oct

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MEADOWLARKS, BLACKBIRDS		AGELAINI										
Western Meadowlark	<i>Sturnella neglecta</i>	A	A	A	O	X	X	X	X	X	Confirmed	YR 1
Yellow-headed Blackbird	<i>Xanthocephalus xanthocephalus</i>	C	C						X	X	Suspected	15-Mar
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	A	A	C	U	X	X	X	X	X	Confirmed	YR 1
Brewer's Blackbird	<i>Euphagus cyanocephalus</i>	C	U	O		X	X	X	X	X	Suspected	YR 1
Common Grackle	<i>Quiscalus quiscula</i>	U	C	O		X	X	X	X	X	Confirmed	15-Mar
Brown-headed Cowbird	<i>Molothrus ater</i>	U	O			X		X	X	X	Suspected	15-Apr
Northern Oriole	<i>Icterus galbula</i>	C	C			X		X	X	X	Confirmed	7-May
OLD WORLD SPARROWS		PASSERIDAE										
House Sparrow	<i>Passer domesticus</i>	C	C	C	C	X	X		X		Confirmed	YR
FINCHES		CARDUELINAE										
Pine Siskin	<i>Carduelis pinus</i>	U	A	C		X		X	X	X		YR 2
American Goldfinch	<i>Carduelis tristis</i>	C	A	C		X	X	X	X	X	Confirmed	YR
Lesser Goldfinch	<i>Carduelis psaltria</i>	O	U	O		X	X	X	X		Suspected	15-Apr
Cassin's Finch	<i>Carpodacus cassinii</i>	R						X				YR
House Finch	<i>Carpodacus mexicanus</i>	A	A	A	U	X	X	X	X	X	Confirmed	YR
TOTAL SPECIES PRESENT						78	46	68	95	94	Breeding Species = 55	

(1) From Relative Abundance Surveys.

(2) Relative abundance categories use standard U.S. Fish and Wildlife Service notation for birds.

DEFINITIONS

GRA = Grassland

DIS = Disturbed Areas

SHR = Shrubland

WOD = Woodland

MAR = Marshland

Sp = Spring

Su = Summer

Fa = Fall

Wi = Winter

A = Abundant

C = Common

U = Uncommon

O = Occasional

R = Rare

YR = Year-round

YR 1 = Year-round but more common spring/summer

YR 2 = Year-round but more common fall/winter

YR M = Year-round but most common spring/fall migration

1-Apr = Average arrival date of migrants to vicinity

Table 4.3.2-9. Summary of Bird Densities by Season in Xeric Mixed Grassland at Rocky Flats Plant, 1991

SPECIES	Spring/Summer		Fall		Winter		Total	
	Number of Individ.	Density /Hectare	Number of Individ.	Density /Hectare	Number of Individ.	Density /Hectare	Number of Individ.	Density /Hectare
PIGEONS AND DOVES								
Mourning Dove	1	0.03	0	0.00	0	0.00	1	0.01
NIGHTJARS								
Common Nighthawk	7	0.39	0	0.00	0	0.00	7	0.13
TYRANT FLYCATCHERS								
Western Kingbird	0	0.00	1	0.10	0	0.00	1	0.03
Say's Phoebe	2	0.03	1	0.02	0	0.00	3	0.02
LARKS								
Horned Lark	4	0.16	0	0.00	4	0.09	8	0.08
SWALLOWS								
Barn Swallow	4	0.06	1	0.02	0	0.00	5	0.03
CROWS, JAYS, MAGPIES								
Black-billed Magpie	1	0.02	2	0.03	2	0.03	5	0.03
Common Raven	1	0.02	8	0.12	8	0.12	17	0.09
MUSCICAPIDS								
Mountain Bluebird	0	0.00	20	0.30	0	0.00	20	0.10
STARLINGS								
European Starling	1	0.02	16	0.24	0	0.00	17	0.09
TOWHEES AND SPARROWS								
Grasshopper Sparrow	3	0.16	0	0.00	0	0.00	3	0.05
Vesper Sparrow	37	2.48	12	0.73	0	0.00	49	1.07
Song Sparrow	0	0.00	1	0.04	0	0.00	1	0.01
MEADOWLARKS AND BLACKBIRDS								
Western Meadowlark	27	0.88	5	0.18	0	0.00	32	0.35
Red-winged Blackbird	20	0.33	0	0.00	0	0.00	20	0.11
FINCHES								
American Goldfinch	0	0.00	1	0.10	0	0.00	1	0.03
House Finch	0	0.00	3	0.05	0	0.00	3	0.02
Total of Individuals	108		71		14		193	
Calculated Summary of Density		3.316		1.352		0.236		1.54

Table 4.3.2-10. Summary of Bird Densities by Season at Rocky Flats Plant, 1991

SPECIES	Spring/Summer		Fall		Winter		Total	
	Number of Individ.	Density /Hectare	Number of Individ.	Density /Hectare	Number of Individ.	Density /Hectare	Number of Individ.	Density /Hectare
CORMORANTS								
Double-crested Cormorant	1	0.00	1	0.00	0	0.00	2	0.00
HERONS								
Great Blue Heron	2	0.00	0	0.00	0	0.00	2	0.00
Black-crowned Night-heron	1	0.02	0	0.00	0	0.00	1	0.01
GEESE AND DUCKS								
Canada Goose	0	0.00	14	0.01	0	0.00	14	0.00
Mallard	26	0.06	7	0.01	0	0.00	33	0.02
Bufflehead	0	0.00	2	0.00	0	0.00	2	0.00
AMERICAN VULTURES								
Turkey Vulture	2	0.00	0	0.00	0	0.00	2	0.00
EAGLES AND HAWKS								
Red-tailed Hawk	21	0.08	9	0.01	5	0.01	35	0.02
Swainson's Hawk	4	0.07	1	0.00	0	0.00	5	0.01
Rough-legged Hawk	0	0.00	3	0.00	1	0.00	4	0.00
Ferruginous Hawk	2	0.00	6	0.01	1	0.00	9	0.00
Golden Eagle	0	0.00	0	0.00	1	0.00	1	0.00
Northern Harrier	0	0.00	14	0.02	1	0.00	15	0.01
FALCONS								
Prairie Falcon	0	0.00	0	0.00	2	0.00	2	0.00
American Kestrel	3	0.00	6	0.01	3	0.01	12	0.01
PLOVERS								
Killdeer	18	0.03	2	0.00	0	0.00	20	0.01
SANDPIPERS AND ALLIES								
Common Snipe	8	0.02	2	0.01	1	0.02	11	0.01
PIGEONS AND DOVES								
Rock Dove	0	0.00	0	0.00	17	0.02	17	0.01
Mourning Dove	129	0.22	34	0.05	0	0.00	163	0.09
OWLS								
Great Horned Owl	7	0.04	9	0.05	8	0.11	24	0.06
Long-eared Owl	0	0.00	1	0.01	0	0.00	1	0.00
GULLS								
Ring-billed Gull	19	0.02	0	0.00	0	0.00	19	0.01
NIGHTJARS								
Common Nighthawk	9	0.02	0	0.00	0	0.00	9	0.01
WOODPECKERS								
Northern Flicker	0	0.00	17	0.07	0	0.00	17	0.02
Red-naped Sapsucker	0	0.00	1	0.02	0	0.00	1	0.01
Hairy Woodpecker	0	0.00	3	0.02	0	0.00	3	0.01
TYRANT FLYCATCHERS								
Eastern Kingbird	9	0.06	0	0.00	0	0.00	9	0.02
Western Kingbird	21	0.08	1	0.01	0	0.00	21	0.03
Say's Phoebe	11	0.01	11	0.02	0	0.00	22	0.01
Dusky Flycatcher	0	0.00	1	0.00	0	0.00	1	0.00
Western Flycatcher	0	0.00	1	0.01	0	0.00	1	0.00
Western Wood-Pewee	0	0.00	1	0.00	0	0.00	1	0.00

Table 4.3.2-10. Summary of Bird Densities by Season at Rocky Flats Plant, 1991

SPECIES	Spring/Summer		Fall		Winter		Total	
	Number of Indiv.	Density /Hectare	Number of Indiv.	Density /Hectare	Number of Indiv.	Density /Hectare	Number of Indiv.	Density /Hectare
LARKS								
Horned Lark	10	0.02	26	0.03	4	0.01	40	0.02
SWALLOWS								
Violet-green Swallow	1	0.00	0	0.00	0	0.00	1	0.00
Barn Swallow	56	0.05	32	0.03	0	0.00	88	0.03
Cliff Swallow	17	0.01	20	0.02	0	0.00	37	0.01
CROWS, JAYS, MAGPIES								
Bluejay	0	0.00	9	0.01	0	0.00	9	0.00
Black-billed Magpie	26	0.03	33	0.07	30	0.05	89	0.05
Common Raven	2	0.00	33	0.03	20	0.02	55	0.02
American Crow	0	0.00	1	0.00	0	0.00	1	0.00
TITMICE								
Black-capped Chickadee	0	0.00	1	0.02	0	0.00	1	0.01
WRENS								
House Wren	1	0.02	1	0.02	0	0.00	2	0.01
Rock Wren	4	0.01	6	0.03	0	0.00	10	0.01
MUSCICAPIDS								
Mountain Bluebird	0	0.00	24	0.02	0	0.00	24	0.01
Swainson's Thrush	2	0.02	0	0.00	0	0.00	2	0.01
American Robin	9	0.01	1	0.01	0	0.00	10	0.01
THRASHERS								
Gray Catbird	1	0.02	0	0.00	0	0.00	1	0.01
Sage Thrasher	0	0.00	1	0.01	0	0.00	1	0.00
SHRIKES								
Loggerhead Shrike	0	0.00	0	0.00	2	0.00	2	0.00
STARLINGS								
European Starling	132	0.19	32	0.03	5	0.09	169	0.08
VIREOS								
Warbling Vireo	2	0.03	0	0.00	0	0.00	2	0.01
WOOD WARBLERS								
Yellow Warbler	12	0.18	0	0.00	0	0.00	12	0.06
Yellow-rumped Warbler	0	0.00	3	0.05	0	0.00	3	0.02
MacGillivray's Warbler	0	0.00	1	0.02	0	0.00	1	0.01
Common Yellowthroat	12	0.05	8	0.14	0	0.00	20	0.04
Yellow-breasted Chat	5	0.03	0	0.00	0	0.00	5	0.01
Wilson's Warbler	0	0.00	14	0.17	0	0.00	14	0.06
GROSBEAKS AND ALLIES								
Black-headed Grosbeak	0	0.00	1	0.02	0	0.00	1	0.01
Blue Grosbeak	13	0.03	2	0.00	0	0.00	15	0.01
Lazuli Bunting	1	0.00	0	0.00	0	0.00	1	0.00
TOWHEES AND SPARROWS								
Green-tailed Towhee	4	0.01	6	0.04	0	0.00	10	0.01
Rufous-sided Towhee	22	0.13	17	0.08	0	0.00	39	0.07
Grasshopper Sparrow	42	0.09	4	0.05	0	0.00	46	0.04
Vesper Sparrow	216	0.61	53	0.13	0	0.00	269	0.25
Savannah Sparrow	5	0.02	4	0.02	0	0.00	9	0.01
Song Sparrow	52	0.35	35	0.13	5	0.02	92	0.16

Table 4.3.2-10. Summary of Bird Densities by Season at Rocky Flats Plant, 1991

SPECIES	Spring/Summer		Fall		Winter		Total	
	Number of Individ.	Density /Hectare	Number of Individ.	Density /Hectare	Number of Individ.	Density /Hectare	Number of Individ.	Density /Hectare
Lark Sparrow	0	0.00	5	0.04	0	0.00	5	0.01
American Tree Sparrow	0	0.00	4	0.01	16	0.16	20	0.04
Chipping Sparrow	0	0.00	18	0.04	0	0.00	18	0.01
Clay-colored Sparrow	0	0.00	1	0.00	0	0.00	1	0.00
Dark-eyed Junco	0	0.00	6	0.04	0	0.00	6	0.01
White-crowned Sparrow	0	0.00	55	0.70	0	0.00	55	0.23
MEADOWLARKS AND BLACKBIRDS								
Western Meadowlark	381	0.66	119	0.25	1	0.00	501	0.30
Red-winged Blackbird	415	1.07	66	0.07	0	0.00	481	0.34
Brewer's Blackbird	34	0.05	0	0.00	0	0.00	34	0.02
Common Grackle	29	0.06	1	0.00	0	0.00	30	0.02
Brown-headed Cowbird	9	0.09	0	0.00	0	0.00	9	0.03
Northern Oriole	53	0.24	0	0.00	0	0.00	53	0.08
OLD WORLD SPARROWS								
House Sparrow	0	0.00	2	0.00	0	0.00	2	0.00
FINCHES								
Pine Siskin	0	0.00	34	0.04	0	0.00	34	0.01
American Goldfinch	47	0.24	46	0.09	0	0.00	93	0.09
Lesser Goldfinch	2	0.02	3	0.01	0	0.00	5	0.01
House Finch	485	1.03	175	0.27	9	0.02	669	0.43
Total of Individuals	2395		1050		132		3576	
Calculated Summary of Density		4.93		10.21		1.21		2.24

Table 4.3.2-11. Species of Special Interest: Raptors at Rocky Flats Plant, 1991 (1)

Page 1 of 2

SPECIES	HABITAT					TOTAL
	GRASSLAND	DISTURBED	SHRUBLAND	WOODLAND	MARSHLAND	
	No. of Indiv. (2)	No. of Indiv.	No. of Indiv.	No. of Indiv.	No. of Indiv.	No. of Indiv.
SPRING						
Turkey Vulture	6		1			7
Sharp-shinned Hawk		3	1	1		5
Red-tailed Hawk	10	1		17		28
Swainson's Hawk	3				1	4
Ferruginous Hawk	3			6		9
Golden Eagle	3				1	4
Northern Harrier	2				2	4
Prairie Falcon	5			2		7
American Kestrel	12	2		7	3	24
Great Horned Owl	1		3	24	1	29
Short-eared Owl			2			2
Number of Species Present	9	3	4	6	5	11
SUMMER						
Turkey Vulture	3	1		1		5
Cooper's Hawk	5				6	11
Red-tailed Hawk	12	1	1	33		47
Swainson's Hawk				8		8
Ferruginous Hawk	3		1	1	1	6
Golden Eagle	4					4
Northern Harrier	4					4
American Kestrel	3	1	2	1		7
Great Horned Owl	3	6	8	19		36
Number of Species Present	8	4	4	6	2	9
FALL						
Turkey Vulture			1			1
Red-tailed Hawk	6	4		12	1	23
Swainson's Hawk			1			1
Rough-legged Hawk	4	1		1	1	7
Ferruginous Hawk	4		1	3	1	9
Northern Harrier	7	1	5	3	3	19
Peregrine Falcon	2					2
American Kestrel	5	2	1	9	1	18
Great Horned Owl		3	5	20		28
Long-eared Owl				1		1
Short-eared Owl	1					1
Number of Species Present	7	5	6	7	5	11
WINTER						
Red-tailed Hawk	9	3	3	6	1	22
Rough-legged Hawk	18	1		5	1	25
Ferruginous Hawk	3	1				4

Table 4.5.1-1. Threatened and Endangered Species With Potential Habitat at RFP

Common Name	Scientific Name	Status ¹
Federal Threatened Plant Species		
Plateau Lady's Tresses	<i>Spiranthes diluvialis</i>	Threatened
Federal Candidate Plant Species		
Colorado Butterfly Plant	<i>Gaura neomexicana</i> var. <i>coloradensis</i>	C-1
Bell's Twinpod	<i>Physaria bellii</i>	C-2
Colorado Plant Species of Special Concern		
Toothcup	<i>Rotala ramosior</i>	CO-3
Gay-feather	<i>Liatris ligulistylis</i>	CO-3
Forktip Threawn ²	<i>Aristida basiramea</i>	CO-3
Federal Endangered Wildlife Species		
Bald Eagle ²	<i>Haliaeetus leucocephalus</i>	Endangered
Peregrine Falcon ²	<i>Falco peregrinus</i> (2 Subspecies)	Endangered
Whooping Crane	<i>Grus americana</i>	Endangered
Piping Plover	<i>Charadrius melodus</i>	Endangered
Least Tern	<i>Sterna antillarum</i>	Endangered
Black-footed Ferret	<i>Mustela nigripes</i>	Endangered
Federal Candidate Wildlife Species		
Plains Topminnow	<i>Fundulus sciadicus</i>	C-2
Texas Horned Lizard	<i>Phrynosoma cornutum</i>	C-2
White-faced Ibis	<i>Plegadis chihi</i>	C-2
Harlequin Duck	<i>Histrionicus histrionicus</i>	C-2
Ferruginous Hawk	<i>Buteo regalis</i>	C-2
Western Snowy Plover	<i>Charadrius alexandrinus nivosus</i>	C-2
Mountain Plover	<i>Charadrius montanus</i>	C-2
Black Tern	<i>Chidonias niger</i>	C-2
Long-billed Curlew	<i>Numenius americanus</i>	C-C3
Preble's Meadow Jumping Mouse	<i>Zapus hudsonius preblei</i>	C-2
Fringed-tailed Myotis	<i>Myotis thysanodes pahasapensis</i>	C-2
Swift Fox	<i>Vulpes velox</i>	C-2

¹ Category 1 (C-1) USFWS has enough data to propose listing (USFWS 1990, 1991); Category 2 (C-2) USFWS has data indicating vulnerability (USFWS 1990, 1991); Category C-C3 species more abundant than originally thought; Taxa rare in Colorado (CO-3) (CNAP 1991).

² Species that have been identified at Rocky Flats Plant.

Appendix A

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Fish Species List, Rocky Flats Plant, 1991

SCIENTIFIC NAME	COMMON NAME
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CYPRINIDAE (6 Species)	MINNOW FAMILY
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<i>Campostoma anomalum</i>	Stoneroller
<i>Cyprinus carpio</i>	Carp
<i>Carassius auratus</i>	Gold Fish
<i>Pimephales promelas</i>	Fathead Minnow
<i>Notemigonus crysoleucas</i>	Golden Shiner
<i>Semotilus atromaculatus</i>	Creek Chub

CATOSTOMIDAE (1 Species)	SUCKER FAMILY
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<i>Catostomus commersoni</i>	White Sucker
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CENTRARCHIDAE (2 Species)	SUNFISH FAMILY
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<i>Lepomis cyanellus</i>	Green Sunfish
<i>Micropterus salmoides</i>	Largemouth Bass

Total Number of Fish Species = 9

Plant Species List, Rocky Flats Plant, 1991

SCIENTIFIC NAME⁽¹⁾COMMON NAMELichens (25 Species)Lichens

Acarospora fuscata (Schrad.) Arn.
Aspicilia caesiocinerea (Nyl.) Arn.
Caloplaca lamprocheila (DC.) Flag.
Candelariella rosulans Muell.-Arg.
Cladonia pyxidata (L.) Fr.
Dermatocarpon lachneum (Ach.) A. L. Sm.
Dimelaena oreina Norm.
Diploschistes scruposus (Schreb.) Norm.
Lecanora chrysoleuca (Sm.) Ach.
Lecanora muralis (Schreb.) Rabenh.
Lecidea auriculata Th. Fr.
Parmelia exasperatula (Ach.) Nyl.
Parmelia subdecepiens Vain. ex Lynge.
Parmelia subramigera Gyl.
Parmelia ulophyllodes (Vain.) Savicz.
Parmelia (Xanthoparmelia) indet.
Peltigera canina (L.) Willd. var. *rufescens* (Weiss) Mudd.
Physcia orbicularis (Neck.) Poetsch.
Physcia caesia (Hoffm.) Hampe.
Physcia dubia (Hoffm.) Lett.
Physcia stellaris (L.) Nyl.
Physconia grisea (Lam.) Poelt.
Rinodina sp. indet.
Sarcogyne clavus (Ram. ex Lam. and DC.) Kremp.
Xanthoria fallax (Hepp in Arn.) Arn.

Division Bryophyta (Bryophytes) (16 Species)

Amblystegium serpens (Hedw.) B.S.G. var. *juratzkanum* (Schimp.)
Brachythecium fendleri (Sull.) Jaeg. et Sauerb.
Bryum agenteum Hedw.
Bryum caespitium Hedw.
Bryum capillare Hedw.
Campylium chrysophyllum (Brid.) J. Lange.
Ceratodon purpureus (Hedw.) Brid.
Drepanocladus aduncus (Hedw.) Warnst.
Grimmia montana B.S.G.
Marchantia polymorpha L.
Orthotrichum pallens Bruch ex Brid.
Orthotrichum pumilum Sw.
Physcomitrium pyriforme (Hedw.) Hampe.

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<u>SCIENTIFIC NAME</u>	<u>COMMON NAME</u>
<i>Pohlia nutans</i> (Hedw.) Lindb. <i>Polytrichum piliferum</i> Hedw. <i>Tortula ruralis</i> (Hedw.) Gaertn.	
<u>Pteridophytes</u> (Vascular Cryptograms) (4 Species)	
SELAGINELLACEAE (1 Species)	Selaginella Family
<i>Selaginella densa</i> Rydb.	Small Clubmoss (D) ⁽²⁾
EQUISETACEAE (3 Species)	Horsetail Family
<i>Equisetum arvense</i> L.	Field Horsetail (D)
<i>Equisetum laevigatum</i> A. Br.	Smooth Horsetail
<i>Equisetum hyemale</i> L.	Scouring Rush (D)
<u>Division Pinophyta</u> (Gymnosperms or Naked Seed) (5 Species)	
CUPRESSACEAE (2 Species)	Cypress Family
<i>Juniperus communis</i> L.	Common Juniper (D)
<i>Juniperus virginiana</i> L.	Red Cedar (ORN) (D)
PINACEAE (3 Species)	Pine Family
<i>Picea pungens</i> Engelm.	Blue Spruce (ORN) (D)
<i>Pinus ponderosa</i> Laws	Ponderosa Pine
<i>Pseudotsuga menziesii</i> (Mirb.) Franco	Douglas-Fir (D)
<u>Division Magnoliophyta</u> (Flowering Plants) (483 Species)	
<u>Class Magnoliopsida</u> (Dicots) (59 Families, 350 Species)	
CERATOPHYLLACEAE (1 Species)	Hornwort Family
<i>Ceratophyllum demersum</i> L.	Coontail (D)
RANUNCULACEAE (9 Species)	Buttercup Family
<i>Anemone cylindrica</i> A. Gray	Candle Anemone
<i>Anemone patens</i> L.	Pasque-flower (D)
<i>Clematis ligusticifolia</i> Nutt.	Western Clematis
<i>Delphinium nuttallianum</i> Pritz. ex Walpers	Larkspur
[= <i>Delphinium nelsonii</i> Greene]	
<i>Delphinium virens</i> Nutt.	Prairie Larkspur

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SCIENTIFIC NAME	COMMON NAME
<i>Myosurus minimus</i> L.	Mousetail
<i>Ranunculus cymbalaria</i> Pursh.	Shore Buttercup (D)
<i>Ranunculus longirostris</i> Godr. [= <i>Ranunculus aquatilis</i> L.]	White Water Crowfoot
<i>Ranunculus macounii</i> Britt.	Macoun's Buttercup
BERBERIDACEAE (1 Species)	Barberry Family
<i>Berberis repens</i> Lindl. [= <i>Mahonia repens</i> (Lindl.) G. Don]	Oregon Grape
PAPAVERACEAE (1 Species)	Poppy Family
<i>Argemone polyanthemosa</i> (Fedde) G. Ownbey	Prickle Poppy
FUMARIACEAE (1 Species)	Fumitory Family
<i>Corydalis aurea</i> Willd.	Golden Corydalis (D)
ULMACEAE (1 Species)	Elm Family
<i>Ulmus pumila</i> L.	Siberian Elm (ORN) (D)
CANNABACEAE (1 Species)	Hemp Family
<i>Humulus lupulus</i> L.	Common Hop (D)
URTICACEAE (1 Species)	Nettle Family
<i>Urtica dioica</i> L.	Stinging Nettle (D)
NYCTAGINACEAE (3 Species)	Four-O'Clock Family
<i>Mirabilis hirsuta</i> (Pursh.) MacM. [= <i>Oxybaphus hirsutus</i> Sweet]	Hairy Four-O'Clock (D)
<i>Mirabilis linearis</i> (Pursh.) Heimerl [= <i>Oxybaphus linearis</i> (Pursh.) Robin.]	Narrowleaf Four-O'Clock
<i>Mirabilis nyctaginea</i> (Michx.) MacM. [= <i>Oxybaphus nyctagineus</i> (Michx.) Porter & Coult.]	Wild Four-O'Clock
CACTACEAE (7 Species)	Cactus Family
<i>Coryphantha missouriensis</i> (Sweet) Britt. & Rose	Nipple Cactus
<i>Echinocereus viridiflorus</i> Engelm.	Hedgehog Cactus
<i>Coryphantha missouriensis</i> (Sweet) Britt. & Rose	Coryphantha

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SCIENTIFIC NAME	COMMON NAME
[= <i>Mammillaria missouriensis</i> Sweet]	
<i>Opuntia fragilis</i> (Nutt.) Haw.	Brittle Prickly Pear
<i>Opuntia humifusa</i> (Raf.) Raf.	Prickly Pear Cactus
[= <i>Opuntia compressa</i> (Salisb.) Macbr.]	
<i>Opuntia polyacantha</i> Haw.	Plains Prickly Pear
<i>Pediocactus simpsonii</i> (Engelm.) Britt. & Rose	Mountain Ball Cactus
CHENOPODIACEAE (7 Species)	Goosefoot Family
<i>Atriplex canescens</i> (Pursh.) Nutt.	Four-winged Saltbush (D)
<i>Chenopodium album</i> L.	Lamb's-quarters
<i>Chenopodium botrys</i> L.	Jerusalem Oak
<i>Chenopodium fremontii</i> S. Wats.	Fremont Goosefoot (D)
<i>Chenopodium leptophyllum</i> Nutt. ex Moq.	Goosefoot
<i>Kochia scoparia</i> (L.) Schrad.	Kochia (D)
<i>Salsola iberica</i> Senn. & Pau.	Russian-thistle (D)
AMARANTHACEAE (2 Species)	Pigweed Family
<i>Amaranthus graecizans</i> L.	Tumbleweed (D)
<i>Amaranthus retroflexus</i> L.	Rough Pigweed (D)
PORTULACACEAE (3 Species)	Purslane Family
<i>Claytonia lanceolata</i> Pursh.	Spring Beauty (D)
[= <i>Claytonia rosea</i> Rydb.]	
<i>Portulaca oleracea</i> L.	Common Purslane (D)
<i>Talinum parviflorum</i> Nutt.	Prairie Flameflower
CARYOPHYLLACEAE (10 Species)	Pink Family
<i>Arenaria fendleri</i> A. Gray	Fendler Sandwort
<i>Cerastium arvense</i> L.	Prairie Chickweed
<i>Cerastium nutans</i> Raf.	Powderhorn Cerastium
<i>Cerastium vulgatum</i> L.	Common Mouse-ear
[= <i>Cerastium fontanum</i> Baumg.]	
<i>Paronychia jamesii</i> T. & G. James	Nailwort
<i>Silene antirrhina</i> L.	Sleepy Catchfly
<i>Silene drummondii</i> Hook.	Campion
[= <i>Melandrium drummondii</i> (L.) Coss. & Germ.]	
<i>Silene pratensis</i> (Raf.) Godr. & Gren	White Campion
[= <i>Melandrium dioicum</i> (Hook.) Hulten]	
<i>Stellaria longifolia</i> Muhl. ex Willd.	Long-leaved Stitchwort
<i>Vaccaria pyramidata</i> Medic.	Cow Cockle

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SCIENTIFIC NAME	COMMON NAME
POLYGONACEAE (14 Species)	Buckwheat Family
<i>Eriogonum alatum</i> Torr.	Eriogonum
<i>Eriogonum flavum</i> Nutt. [= <i>Eriogonum umbellatum</i> Torr.]	Sulfur-flower
<i>Eriogonum jamesii</i> Benth.	Eriogonum (D)
<i>Polygonum amphibium</i> L. [= <i>Persicaria coccineum</i> Muhl.]	Scarlet Smartweed (D)
<i>Polygonum convolvulus</i> L. [= <i>Tiniaria convolvulus</i> (L.) Webb & Moq.] [= <i>Fallopia convolvulus</i> (L.) A. Love]	Wild Buckwheat
<i>Polygonum douglasii</i> Greene	Knotweed
<i>Polygonum lapathifolium</i> L. [= <i>Persicaria lapathifolium</i> (L.) S. Gray]	Pale Smartweed
<i>Polygonum pensylvanicum</i> L. [= <i>Persicaria pennsylvanica</i> (L.) Gomez.]	Smartweed (D)
<i>Polygonum persicaria</i> L. [= <i>Persicaria maculata</i> (Raf.) S. Gray]	Lady's Thumb
<i>Polygonum sawatchense</i> Small	Sawatch Smartweed (D)
<i>Rumex acetosella</i> L.	Sheep Sorrel
<i>Rumex crispus</i> L.	Curly Dock
<i>Rumex mexicanus</i> Meisn. [= <i>Rumex salicifolius</i> Weinm.]	Willow-leaved Dock
<i>Rumex obtusifolius</i> L.	Bitter Dock (D)
CLUSIACEAE (Formerly Hypericaeae) (1 Species)	St. Johns-wort Family
<i>Hypericum perforatum</i> L.	Common St. John's-wort
MALVACEAE (3 Species)	Mallow Family
<i>Malva neglecta</i> Wallr.	Common Mallow (D)
<i>Malva rotundifolia</i> L.	Common Mallow (D)
<i>Sphaeralcea coccinea</i> (Pursh.) Rydb.	Red False Mallow
VIOLACEAE (3 Species)	Violet Family
<i>Viola canadensis</i> L.	Canada Violet
<i>Viola nephrophylla</i> Greene	Northern Bog Violet (D)
<i>Viola nuttallii</i> Pursh.	Yellow Prairie Violet

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SCIENTIFIC NAME	COMMON NAME
LOASACEAE (1 Species)	Stick Leaf Family
<i>Mentzelia decapetala</i> (Pursh.) Urban & Gilg.	Ten-petal Blazing Star (D)
SALICACEAE (7 Species)	Willow Family
<i>Populus x acuminata</i> Rydb.	Hybrid Cottonwood (D)
<i>Populus alba</i> L.	White Poplar (D)
<i>Populus angustifolia</i> James	Narrow-leaved Cottonwood (D)
<i>Populus deltoides</i> Marsh.	
var. <i>occidentalis</i> Rydb.	Plains Cottonwood
[= <i>Populus sargentii</i> Dode]	
<i>Salix amygdaloides</i> Anderss.	Peach-leaved Willow
<i>Salix exigua</i> Nutt.	
ssp. <i>interior</i> (Rowlee) Cronq.	Coyote Willow
[= <i>Salix interior</i> Rowlee]	
<i>Salix ligulifolia</i> (Ball) Ball	Willow
BRASSICACEAE (Formerly Cruciferae) (28 Species)	Mustard Family
<i>Alyssum alyssoides</i> L.	Alyssum
<i>Alyssum minus</i> (L.) Rothmaler	Alyssum
<i>Arabis fendleri</i> (Wats.) Greene	Rock Cress
<i>Arabis glabra</i> (L.) Bernh.	Tower Mustard
<i>Arabis hirsuta</i> (L.) Scop.	Rock Cress
<i>Barbarea orthoceras</i> Ledeb.	Winter Cress
<i>Camelina microcarpa</i> Andr.	Small-seeded False Flax
<i>Capsella bursa-pastoris</i> (L.) Medic.	Shepherd's Purse (D)
<i>Cardaria chalepensis</i> (L.) Hand-Mazz	White-top (D)
<i>Cardaria draba</i> (L.) Desv.	Hoary Cress
<i>Chorispora tenella</i> (Pall.) DC.	Blue Mustard (D)
<i>Conringia orientalis</i> (L.) Dum.	Hare's-ear Mustard (D)
<i>Descurania pinnata</i> (Walt.) Britt.	Tansy Mustard
<i>Descurania richardsonii</i> (Sweet) Schultz	Tansy Mustard (D)
<i>Descurania sophia</i> (L.) Webb	Flixweed
<i>Draba nemorosa</i> L.	Yellow Whitlow-wort (D)
<i>Erysimum asperum</i> (Nutt.) DC.	Western Wallflower
<i>Lepidium campestre</i> (L.) R. Br.	Field Peppergrass
<i>Lepidium densiflorum</i> Schrad.	Peppergrass (D)
<i>Lepidium latifolium</i> L.	Tall Whitetop (D)
<i>Lesquerella montana</i> (A. Gray) Wats.	Mountain Bladderpod
<i>Nasturtium officinale</i> R. Br.	Watercress
<i>Physaria vivulifera</i> Rydb.	Double Bladder-pod (D)
<i>Rorippa palustris</i> (L.) Bess.	Bog Yellow Cress
<i>Rorippa sinuata</i> (Nutt.) Hitchc.	Spreading Yellow Cress (D)

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SCIENTIFIC NAME	COMMON NAME
<i>Sisymbrium altissimum</i> L.	Tumbling Mustard
<i>Thlaspi arvense</i> L.	Penny Cress
<i>Thlaspi montanum</i> L.	Penney Cress (D)
PRIMULACEAE (3 Species)	Primrose Family
<i>Androsace occidentalis</i> Pursh.	Western Rock Jasmine
<i>Dodecatheon pulchellum</i> (Raf.) Merrill	Shooting Star
<i>Lysimachia ciliata</i> L.	Fringed Loosestrife
GROSSULARIACEAE (2 Species)	Currant Family
<i>Ribes cereum</i> Dougl.	Western Red Currant (D)
<i>Ribes odoratum</i> Wendl.	Golden Currant
[= <i>Ribes aureum</i> Pursh.]	
CRASSULACEAE (1 Species)	Stonecrop Family
<i>Sedum lanceolatum</i> Torr.	Stonecrop
SAXIFRAGACEAE (1 Species)	Saxifrage Family
<i>Heuchera parvifolia</i> Nutt. ex T. & G.	Alumroot
ROSACEAE (19 Species)	Rose Family
<i>Agrimonia striata</i> Michx.	Agrimony
<i>Amelanchier alnifolia</i> Nutt.	Juneberry
<i>Crataegus erythropoda</i> Ashe	Hawthorn
<i>Geum aleppicum</i> Jacq.	Yellow Avens (D)
<i>Geum macrophyllum</i> Willd.	Large-leaved Avens (D)
<i>Physocarpus monogynus</i> (Torr.) Coult.	Ninebark
<i>Potentilla anserina</i> L.	Silverweed (D)
[= <i>Argentina anserina</i> (L.) Rydb.]	
<i>Potentilla gracilis</i> Dougl. ex Hook.	Cinquefoil
<i>Potentilla hippiana</i> Lehm.	Wooly Cinquefoil
<i>Potentilla fissa</i> Pursh.	Sticky Cinquefoil
[= <i>Drymocallis arguta</i> (Pursh.) Rydb.]	
<i>Potentilla rivalis</i> Nutt.	Cinquefoil (D)
<i>Prunus americana</i> Marsh.	Wild Plum
<i>Prunus virginiana</i> L.	Chokecherry
<i>Pyrus malus</i> L.	Apple
<i>Rosa acicularis</i> Lindl.	Prickly Wild Rose (D)
<i>Rosa arkansana</i> Porter	Prairie Wild Rose
<i>Rosa woodsii</i> Lindl.	Western Wild Rose (D)

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SCIENTIFIC NAME	COMMON NAME
<i>Rubus deliciosus</i> James	Boulder Raspberry (D)
<i>Rubus idaeus</i> L.	Raspberry
FABACEAE (33 Species)	Bean Family
<i>Amorpha fruticosa</i> L.	False Indigo
<i>Astragalus adsurgens</i> Pall.	Standing Milkvech
<i>Astragalus agrestis</i> Dougl. ex D. Don	Field Milkvech
[= <i>Astragalus dasyglottis</i> Fisch. ex DC.]	
<i>Astragalus bisulcatus</i> (Hook.) Gray	Two-grooved Milkvech
<i>Astragalus crassicaupus</i> Nutt.	Ground-plum
<i>Astragalus drummondii</i> Dougl. ex Hook.	Drummond Milkvech
<i>Astragalus flexuosus</i> (Hook.) D. Don	Slender Milkvech
<i>Astragalus missouriensis</i> Nutt.	Missouri Milkvech (D)
<i>Astragalus shortianus</i> Nutt. ex T. & G.	Short Milkvech
<i>Astragalus spatulatus</i> Sheld.	Draba Milkvech (D)
<i>Astragalus tridactylus</i> A. Gray	Three-fingered Milkvech (D)
<i>Coronilla varia</i> L.	Crown Vetch (D)
<i>Dalea candida</i> Willd.	White Prairie Clover
[= <i>Petalostemon candidum</i> (Willd.) Michx.]	
<i>Dalea purpurea</i> Vent	Purple Prairie Clover
[= <i>Petalostemon purpureum</i> (Vent) Rydb.]	
<i>Glycyrrhiza lepidota</i> Pursh.	Wild Licorice
<i>Lathyrus eucosmus</i> Butters and St. John	Purple Peavine
<i>Lathyrus latifolius</i> L.	Perennial Sweet Pea (D)
<i>Lespedeza capitata</i> Michx.	Bush Clover (D)
<i>Lotus corniculatus</i> L.	Birdfoot Trefoil (D)
<i>Lupinus argenteus</i> Pursh.	Silvery Lupine
<i>Medicago lupulina</i> L.	Black Medic
<i>Medicago sativa</i> L.	Alfalfa (D)
<i>Melilotus alba</i> Medic.	White Sweetclover
<i>Melilotus officinalis</i> (L.) Pall.	Yellow Sweetclover
<i>Oxytropis lambertii</i> Pursh.	Purple Locoweed
<i>Psoralea tenuiflora</i> Pursh.	Wild Alfalfa
<i>Robinia pseudo-acacia</i> L.	Black Locust (D)
<i>Thermopsis divaricarpa</i> Nels.	Golden Banner
<i>Trifolium dubium</i> Sibth.	Small Hop-clover (D)
<i>Trifolium hybridum</i> L.	Alsike Clover
<i>Trifolium pratense</i> L.	Red Clover
<i>Trifolium repens</i> L.	White Clover (D)
<i>Vicia americana</i> Muhl. ex Willd.	American Vetch

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SCIENTIFIC NAME	COMMON NAME
ELAEAGNACEAE (1 Species)	Russian Olive Family
<i>Elaeagnus angustifolia</i> L.	Russian Olive (D)
LYTHRACEAE (1 Species)	Loosestrife Family
<i>Lythrum alatum</i> Pursh.	Purple Loosestrife
ONAGRACEAE (9 Species)	Evening Primrose Family
<i>Calylophus serrulatus</i> (Nutt.) Raven	Plains Yellow Evening Primrose
<i>Epilobium ciliatum</i> Raf.	Willow Herb
[= <i>Epilobium adenocaulon</i> Hausskn.]	
<i>Epilobium hornemanii</i> Hausskn.	Willow Herb (D)
<i>Epilobium leptophyllum</i> Raf.	Linear-leaf Willow Herb (D)
<i>Epilobium paniculatum</i> Nutt.	Willow Herb
<i>Gaura coccinea</i> Pursh.	Scarlet Gaura
<i>Gaura parviflora</i> Dougl.	Velvety Gaura (D)
<i>Oenothera brachycarpa</i> Gray	Yellow Stemless Evening Primrose
<i>Oenothera flava</i> (A. Nels.) Garrett	Common Evening Primrose
[= <i>Oenothera strigosa</i> (Rydb.) Mack. & Bush]	
CORNACEAE (1 Species)	Dogwood Family
<i>Cornus stolonifera</i> Michx.	Red Osier (D)
SANTALACEAE (1 Species)	Sandalwood Family
<i>Comandra umbellata</i> (L.) Nutt.	Bastard Toadflax
EUPHORBIACEAE (6 Species)	Spurge Family
<i>Croton texensis</i> (Klotzsch) Muell. Arg.	Texas Croton (D)
<i>Euphorbia dentata</i> Michx.	Toothed Spurge (D)
<i>Euphorbia marginata</i> Pursh.	Snow-on-the-mountain
<i>Euphorbia robusta</i> (Engelm.) Small	Rocky Mountain Spurge
<i>Euphorbia serpyllifolia</i> Pers.	Thyme-leaved Spurge
[= <i>Chamaesyce serpyllifolia</i> (Pers.) Small]	
<i>Tragia betonicifolia</i> Nutt.	Noseburn (D)
[= <i>Tragia urticifolia</i> Michx.]	
VITACEAE (2 Species)	Grape Family
<i>Parthenocissus vitacea</i> (Knerr) Hitchc.	Woodbine (D)
<i>Vitis riparia</i> Michx.	River-bank Grape (D)

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LINACEAE (1 Species)	Flax Family
<i>Linum perenne</i> L. var. <i>lewisii</i> (Pursh.) Eat. & Wright	Blue Flax
ACERACEAE (2 Species)	Maple Family
<i>Acer glabrum</i> Torr. <i>Acer negundo</i> L.	Mountain Maple (D) Box-elder (D)
ANACARDIACEAE (2 Species)	Cashew Family
<i>Rhus aromatica</i> Ait. var. <i>trilobata</i> (Nutt.) A. Gray <i>Toxicodendron rydbergii</i> (Small ex Rydb.) Greene	Aromatic Sumac Poison Ivy
OXALIDACEAE (1 Species)	Wood Sorrel Family
<i>Oxalis dillenii</i> Jacq.	Wood Sorrel
GERANIACEAE (2 Species)	Geranium Family
<i>Erodium cicutarium</i> (L.) L'Her. <i>Geranium caespitosum</i> James [= <i>Geranium fremontii</i> Torr. ex Gray]	Filaree Common Wild Geranium
APIACEAE (Formerly Umbelliferae) (7 Species)	Parsley Family
<i>Cicuta maculata</i> L. <i>Conium maculatum</i> L. <i>Harbouria trachypleura</i> (Gray) C. & R. <i>Heracleum sphondylium</i> L. [= <i>Heracleum lanatum</i> Michx.] <i>Lomatium orientale</i> Coult. & Rose <i>Musineon divaricatum</i> (Pursh.) Nutt. ex T. & G. <i>Osmorhiza depauperata</i> Phil.	Water Hemlock (D) Poison Hemlock (D) Whiskbroom Parsley Cow Parsnip Wild Parsley Musineon Sweet Cicely (D)
GENTIANACEAE (2 Species)	Gentian Family
<i>Gentiana affinis</i> Griseb. [= <i>Pneumonanthe affinis</i> (Griseb.) Greene] <i>Sweria radiata</i> (Kell.) O. Ktze. [= <i>Frasera speciosa</i> Dougl.]	Blue Gentian Monument Plant

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APOCYNACEAE (2 Species)	Dogbane Family
<i>Apocynum androsaemifolium</i> L.	Spreading Dogbane (D)
<i>Apocynum cannabinum</i> L.	Hemp Dogbane (D)
[= <i>Apocynum sibiricum</i> Jacq.]	Prairie Dogbane (D)
ASCLEPIADACEAE (4 Species)	Milkweed Family
<i>Asclepias incarnata</i> L.	Swamp Milkweed (D)
<i>Asclepias pumila</i> (Gray) Vail	Dwarf Milkweed (D)
<i>Asclepias speciosa</i> Torr.	Showy Milkweed
<i>Asclepias viridiflora</i> Raf.	Green Milkweed
SOLANACEAE (7 Species)	Nightshade Family
<i>Physalis heterophylla</i> Nees	Ground Cherry (D)
<i>Physalis virginiana</i> P. Mill.	Ground Cherry
<i>Quincula lobata</i> (Torr.) Raf.	Chinese Lantern
[= <i>Physalis lobata</i> Torr.]	
<i>Solanum prycanthum</i> Dun. ex DC.	Black Nightshade (D)
[= <i>Solanum americanum</i> L.]	
<i>Solanum elaeagnifolium</i> Cav.	Silver-leaf Nightshade (D)
<i>Solanum rostratum</i> Dun.	Buffalo Bur
<i>Solanum triflorum</i> Nutt.	Cut-leaved Nightshade (D)
CONVOLVULACEAE (3 Species)	Convolvulus Family
<i>Calystegia sepium</i> (L.) R. Br.	Hedge Bindweed
[= <i>Convolvulus sepium</i> L.]	
<i>Convolvulus arvensis</i> L.	Field Bindweed
<i>Evolvulus nuttallianus</i> R. & S.	Evolvulus (D)
CUSCUTACEAE (1 Species)	Dodder Family
<i>Cuscuta approximata</i> Bab.	Dodder
POLEMONIACEAE (4 Species)	Polemonium Family
<i>Collomia linearis</i> Nutt.	Collomia
<i>Gilia ophthalmoides</i> Brand.	Gilia
ssp. <i>clokeyi</i> (Mason) A. & V. Grant	Spike Gilia
<i>Ipomopsis spicata</i> (Nutt.) V. Grant	
[= <i>Gilia spicata</i> Nutt.]	
<i>Navarretia minima</i> Nutt.	Navarretia

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HYDROPHYLLACEAE (3 Species)	Waterleaf Family
<i>Hydrophyllum fendleri</i> (Gray) Heller	Waterleaf
<i>Phacelia heterophylla</i> Pursh.	Scorpionweed
<i>Phacelia neomexicana</i> Thurber ex Torr.	Scorpionweed (D)
BORAGINACEAE (5 Species)	Borage Family
<i>Cynoglossum officinale</i> L.	Hound's Tongue
<i>Lappula redowskii</i> (Homem.) Greene	Low Stickseed
[= <i>Lappula occidentalis</i> (Wats.) Greene]	
<i>Lithospermum incisum</i> Lehm.	Narrow-leaved Puccoon
<i>Mertensia lanceolata</i> (Pursh.) A. DC.	Wild Forget-me-not
<i>Onosmodium molle</i> Michx.	Marbleseed
VERBENACEAE (3 Species)	Vervain Family
<i>Lippia cuneifolia</i> (Torr.) Steud.	Fog-fruit
[= <i>Phyla cuneifolia</i> (Torr.) Greene]	
<i>Verbena bracteata</i> Lag. & Rodr.	Bracted Vervain
<i>Verbena hastata</i> L.	Blue Vervain
LAMIACEAE (Formerly Labiatae) (13 Species)	Mint Family
<i>Dracocephalum parviflorum</i> Nutt.	Dragonhead (D)
<i>Hedeoma hispidum</i> Pursh.	Rough Pennyroyal
<i>Lycopus americanum</i> Muhl. ex Barton	Water-horehound (D)
<i>Marrubium vulgare</i> L.	Common Horehound (D)
<i>Mentha arvensis</i> L.	Field Mint
<i>Monarda fistulosa</i> L.	Wild Bergamot
<i>Monarda pectinata</i> Nutt.	Spotted Bee-Balm (D)
<i>Nepeta cataria</i> L.	Catnip
<i>Prunella vulgaris</i> L.	Selfheal
<i>Salvia reflexa</i> Homem.	Lance-leaved Sage
<i>Scutellaria brittonii</i> Porter	Skullcap
<i>Stachys palustris</i> L.	Hedge Nettle (D)
<i>Teucrium canadense</i> L.	American Germander (D)
CALLITRICHACEAE (1 Species)	Water Starwort
<i>Callitriche palustris</i> L.	Water Starwort
PLANTAGINACE (3 Species)	Plantain Family
<i>Plantago lanceolata</i> L.	English Plantain

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<i>Plantago major</i> L.	Common Plantain (D)
<i>Plantago patagonica</i> Jacq.	Patagonian Plantain
SCROPHULARIACEAE (18 Species)	Figwort Family
<i>Castilleja integra</i> A. Gray	Orange Paintbrush
<i>Castilleja sessiliflora</i> Pursh.	Plains Paintbrush
<i>Collinsia parviflora</i> Lindl.	Blue Lips
<i>Linaria dalmatica</i> (L.) Mill.	Toadflax
<i>Linaria vulgaris</i> Hill	Toadflax (D)
<i>Mimulus floribundus</i> Dougl. ex Lindl.	Many-flowered Mimulus
<i>Mimulus glabratus</i> H. B. K.	Roundleaf Monkey-flower
<i>Orthocarpus luteus</i> Nutt. ex Pursh.	Owl Clover (D)
<i>Penstemon angustifolius</i> Nutt.	Narrow-leaf Beardtongue (D)
<i>Penstemon secundiflorus</i> Benth.	One-sided Penstemon (D)
<i>Penstemon virens</i> Penn.	Slender Penstemon
<i>Penstemon virgatus</i> Gray	
ssp. <i>asa-grayi</i> Cross.	Beard-tongue
<i>Scrophularia lanceolata</i> Pursh.	Figwort
<i>Verbascum thapsus</i> L.	Common Mullein
<i>Verbascum blattaria</i> L.	Moth Mullein
<i>Veronica americana</i> (Raf.) Schwein. ex Benth.	Brooklime (D)
<i>Veronica anagallis-aquatica</i> L.	Water Speedwell
<i>Veronica peregrina</i> L.	Purslane Speedwell
OROBANCHACEAE (1 Species)	Broomrape Family
<i>Orobanche fasciculata</i> Nutt.	Broomrape
CAMPANULACEAE (1 Species)	Bellflower Family
<i>Campanula rotundifolia</i> L.	Harebell
RUBIACEAE (3 Species)	Madder Family
<i>Galium aparine</i> L.	Catchweed Bedstraw
<i>Galium boreale</i> L.	Northern Bedstraw
<i>Galium trifidum</i> L.	Small Bedstraw (D)
CAPRIFOLIACEAE (2 Species)	Honeysuckle Family
<i>Symphoricarpos occidentalis</i> Hook.	Snowberry
<i>Symphoricarpos oreophilus</i> Gray	Snowberry

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ASTERACEAE (Compositae) (75 Species)	Sunflower Family
<i>Achillea millefolium</i> L.	
ssp. <i>lanulosa</i> (Nutt.) Piper	Yarrow
<i>Agoseris glauca</i> (Pursh.) Dietr.	False Dandelion
<i>Ambrosia artemisiifolia</i> L.	Common Ragweed
<i>Ambrosia psilostachya</i> DC.	Western Ragweed
<i>Ambrosia trifida</i> L.	Giant Ragweed
<i>Antennaria parvifolia</i> Nutt.	Pussytoes
<i>Antennaria macrophylla</i> Rydb.	Pink Pussytoes (D)
[= <i>Antennaria rosea</i> Greene]	
<i>Arctium minus</i> (Hill) Bernh.	Burdock (D)
<i>Arnica fulgens</i> Pursh.	Orange Arnica
<i>Artemisia campestris</i> L.	Sage
<i>Artemisia dracunculus</i> L.	Silky Wormwood
<i>Artemisia frigida</i> Willd.	Fringed Sagebrush
<i>Artemisia ludoviciana</i> Nutt.	White Sage
<i>Leucelene ericoides</i> (Torr.) Greene	Aster (D)
[= <i>Aster arenosus</i> Blake]	
<i>Aster ericoides</i> L.	Aster (D)
<i>Aster falcatus</i> Lindl.	Aster (D)
[= <i>Aster commutatus</i> (T. & G.) Gray]	
<i>Aster laevis</i> L.	Smooth Blue Aster (D)
<i>Aster occidentalis</i> (Nutt.) T. & G.	Western Aster (D)
<i>Aster porteri</i> Gray	White Aster
<i>Bidens cernua</i> L.	Nodding Beggarticks
<i>Carduus nutans</i> L.	Musk Thistle
<i>Centaurea diffusa</i> Lam.	Knapweed (D)
<i>Centaurea repens</i> L.	Russian Knapweed (D)
<i>Centaurea solstitialis</i> L.	Yellow Starthistle (D)
<i>Chrysanthemum leucanthemum</i> L.	Ox-eye Daisy
[= <i>Leucanthemum vulgare</i> Lam.]	
<i>Chrysothamnus nauseosus</i> (Pall.) Britt.	Rabbitbrush (D)
<i>Chrysopsis fulcrata</i> Greene	Golden Aster (D)
[= <i>Heterotheca fulcrata</i> (Pursh.) Shinnery]	
<i>Chrysopsis villosa</i> Pursh.	Golden Aster
[= <i>Heterotheca villosa</i> (Pursh.) Shinnery]	
<i>Cichorium intybus</i> L.	Common Chicory
<i>Cirsium arvense</i> (L.) Scop.	Canada Thistle
<i>Cirsium ochrocentrum</i> Gray	Yellow Spine Thistle
<i>Cirsium undulatum</i> (Nutt.) Spreng.	Wavyleaf Thistle
<i>Conyza canadensis</i> (L.) Cronq.	Horseweed (D)
<i>Crepis occidentalis</i> Nutt.	Hawksbeard
<i>Crepis runcinata</i> (James) T. & G.	Hawksbeard
<i>Dyssodia papposa</i> (Vent) Hitchc.	Field Marigold

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<i>Erigeron canus</i> Gray	Fleabane
<i>Erigeron divergens</i> T. & G.	Fleabane
<i>Erigeron flagellaris</i> Gray	Trailing Fleabane
<i>Erigeron pumilus</i> Nutt.	Low Fleabane
<i>Erigeron strigosus</i> Muhl.	Daisy Fleabane
<i>Gaillardia aristata</i> Pursh.	Blanketflower
<i>Grindelia squarrosa</i> (Pursh.) Dun.	Curly-top Gumweed
<i>Gutierrezia sarothrae</i> (Pursh.) Britt. & Rusby	Broom Snakeweed
<i>Helianthus annuus</i> L.	Common Sunflower
<i>Helianthus nuttallii</i> T. & G.	Nuttall's Sunflower (D)
<i>Helianthus pumilus</i> Nutt.	Low Sunflower
<i>Hymenopappus filifolius</i> Hook.	Hymenopappus
<i>Kuhnia rosmarinifolia</i> Vent.	False Boneset (D)
<i>Kuhnia eupatorioides</i> L.	False Boneset (D)
<i>Lactuca oblongifolia</i> Nutt.	Blue Lettuce (D)
<i>Lactuca serriola</i> L.	Prickly Lettuce
<i>Liatris punctata</i> Hook.	Blazing Star
<i>Lygodesmia juncea</i> (Pursh.) Hook.	Skeleton-weed (D)
<i>Microseris cuspidata</i> (Pursh.) Sch. Bip.	False Dandelion (D)
[= <i>Nothocalais cuspidata</i> (Pursh.) Greene]	
<i>Scorzonera laciniata</i> L.	False Salsify
[= <i>Podospermum lancinatum</i> L.]	
<i>Ratibida columnifera</i> (Nutt.) Woot. & Standl.	Prairie Coneflower
<i>Rudbeckia hirta</i> L.	Black-eyed Susan
<i>Rudbeckia lanciniata</i> L.	Goldenglow
<i>Senecio integerrimus</i> Nutt.	Ragwort
<i>Senecio plattensis</i> Nutt.	Prairie Ragwort
<i>Senecio spartioides</i> T. & G.	Golden Ragwort
<i>Solidago missouriensis</i> Nutt.	Prairie Goldenrod
<i>Solidago mollis</i> Bart.	Soft Goldenrod
<i>Solidago nemoralis</i> Ait.	Gray Goldenrod (D)
<i>Sonchus arvensis</i> L.	
ssp. <i>arvensis</i> L.	Perennial Sow Thistle (D)
<i>Sonchus arvensis</i> L.	
ssp. <i>uglinosus</i> (Bieb.) Nyman	Swamp Sow Thistle (D)
<i>Stephanomeria pauciflora</i> (Torr.) A. Nels.	Wire Lettuce
<i>Taraxacum officinale</i> Weber	Dandelion
<i>Thelesperma megapotanicum</i> (Spreng.) O. Ktze.	Greenthread
<i>Townsendia grandiflora</i> (Nutt.)	Townsendia
<i>Townsendia hookeri</i> Beaman	Townsendia
<i>Tragopogon dubius</i> Scop.	Goatsbeard
<i>Tragopogon porrifolius</i> L.	Salsify
<i>Xanthium strumarium</i> L.	Cocklebur

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SCIENTIFIC NAME**COMMON NAME****Class Liliopsida (Monocots) (12 Families, 132 Species)****ALISMATACEAE (3 Species)****Water Plantain Family**

Alisma subcordatum Raf.
 [= *Alisma plantago-aquatica* L.
 var. *parviflorum* (Pursh.) Torr.]

Water Plantain

Sagittaria cuneata Sheld.

Duck Potato Arrowhead (D)

Sagittaria latifolia Willd.

Common Arrowhead

POTAMOGETONACEAE (1 Species)**Pondweed Family***Potamogeton natans* L.

Pondweed

LEMNACEAE (1 Species)**Duckweed Family***Lemna minor* L.

Duckweed

COMMELINACEAE (1 Species)**Spiderwort Family***Tradescantia occidentalis* (Britt.) Smyth

Prairie Spiderwort

JUNCACEAE (9 Species)**Rush Family***Juncus balticus* Willd.

Baltic Rush

[= *Juncus arcticus* Willd.]*Juncus bufonius* L.

Toad Rush

[= *Juncus sphaerocarpus* Nees.]*Juncus confusus* Cov.

Colorado Rush (D)

Juncus ensifolius Wikst.

Rush

var. *montanus* (Englm.) C. L. Hitchc.[= *Juncus saximontanus* Nels.]*Juncus dudleyi* Wieg.

Dudley Rush

[= *Juncus tenuis* Willd.]*Juncus interior* Wieg.

Inland Rush (D)

Juncus nodosus L.

Knotted Rush

Juncus torreyi Cov.

Torrey's Rush

Juncus tracyi Rydb.

Rush

CYPERACEAE (28 Species)**Sedge Family***Carex athrostachya* Olney

Sedge

Carex aurea Nutt.

Golden Sedge

Carex bebbii (Bailey) Fern

Sedge (D)

Carex brevior (Dew.) Mack. ex Lunell.

Fescue Sedge

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<i>Carex douglasii</i> F. Boott.	Sedge
<i>Carex emoryi</i> Dew.	Emory Sedge
<i>Carex eleocharis</i> Bailey	Sedge
[= <i>Carex stenophylla</i> Wahl.	
ssp. <i>eleocharis</i> (Bailey) Hulten]	
<i>Carex filifolia</i> Nutt.	Thread-leaved Sedge (D)
<i>Carex heliophila</i> Mack.	Sedge
<i>Carex hystericina</i> Muhl.	Sedge
<i>Carex interior</i> Bailey	Sedge
<i>Carex lanuginosa</i> Michx.	Wooly Sedge
<i>Carex nebraskensis</i> Dew.	Sedge
<i>Carex oreocharis</i> Holm	Sedge
<i>Carex praegracilis</i> W. Boott.	Clustered-field Sedge
<i>Carex rostrata</i> Stokes ex Willd.	Sedge
[= <i>Carex urticulata</i> Boott.]	
<i>Carex scoparia</i> Schkuhr.	Broom Sedge
<i>Carex simulata</i> Mack.	Sedge
<i>Carex stipata</i> Muhl.	Sedge
<i>Eleocharis acicularis</i> (L.) R. & S.	Needle Spikesedge (D)
<i>Eleocharis coloradoensis</i> (Britt.) Gilly	Spikesedge
<i>Eleocharis compressa</i> Sulliv.	Flatstem Spikesedge
[= <i>Eleocharis elliptica</i> Kunth.]	
<i>Eleocharis macrostachya</i> Britt.	
[= <i>Eleocharis palustris</i> (L.) R. & S.]	Spike Rush
<i>Eriophorum polystachion</i> L.	Cottongrass (D)
<i>Scirpus acutus</i> Muhl.	Hard-stem Bulrush
<i>Scirpus americanus</i> Pers.	Chair-maker's Rush
<i>Scirpus pallidus</i> (Britt.) Fern	Darkgreen Bulrush
[= <i>Scirpus atrovirens</i> Willd.	
var. <i>pallidus</i> Britt.]	
<i>Scirpus validus</i> Vahl	Great Bulrush
[= <i>Scirpus lacustris</i> L.]	
 POACEAE (Gramineae) (73 Species)	 Grass Family
<i>Agropyron caninum</i> (L.) Beauv.	Slender Wheatgrass
[= <i>Agropyron trachycaulum</i> (Link) Malte ex Lewis]	
<i>Agropyron cristatum</i> (L.) Gaertn.	Crested Wheatgrass
[= <i>Agropyron desertorum</i> (Fisch.) Schult.]	
<i>Agropyron elongatum</i> (Host) Beauv.	Tall Wheatgrass (D)
<i>Agropyron intermedium</i> (Host) Beauv.	Intermediate Wheatgrass (D)
<i>Agropyron pectiniforme</i> R. & S.	Wheatgrass (D)
<i>Agropyron repens</i> (L.) Beauv.	Quackgrass
<i>Agropyron smühii</i> Rydb.	Western Wheatgrass
<i>Agropyron spicatum</i> (Pursh.) Scribn. & Sm.	Bluebunch Wheatgrass (D)

1) Flora of the Great Plains (GPFA 1991) was used for scientific and common names. 2) Species documented during the Baseline Study, but not previously recorded at RFP are designated by a (D).

SCIENTIFIC NAME	COMMON NAME
<i>Agrostis hyemalis</i> (Walt.) B. S. P.	Ticklegrass (D)
<i>Agrostis stolonifera</i> L.	Redtop
[= <i>Agrostis gigantea</i> Roth]	
[= <i>Agrostis alba</i> L.]	
<i>Alopecurus pratensis</i> L.	Meadow Foxtail (D)
<i>Andropogon gerardii</i> Vitman	Big Bluestem
<i>Andropogon scoparius</i> Michx.	Little Bluestem
[= <i>Schizachyrium scoparium</i> (Michx.) Nash]	
<i>Aristida basiramea</i> Engelm.	Forktip Threecawn
<i>Aristida purpurea</i> Nutt. (Merrill) Holmgren & Holmgren	Red Threecawn
<i>Bouteloua curtipendula</i> (Michx.) Torr.	Side-oats Grama
<i>Bouteloua gracilis</i> (H. B. K.) Lag ex Griffiths	Blue Grama
<i>Bouteloua hirsuta</i> Lag.	Hairy Grama (D)
<i>Bromus briziformis</i> F. & M.	Rattlesnake Grass
[= <i>Bromus brizaeformis</i> F. & M.]	
<i>Bromus inermis</i> Leyss.	Smooth Brome
[= <i>Bromopsis inermis</i> (Leyss.) Holub.]	
<i>Bromus japonicus</i> Thunb. ex Murr.	Japanese Brome
<i>Bromus porteri</i> Rydb.	Nodding Brome (D)
<i>Bromus tectorum</i> L.	Cheatgrass
<i>Buchloe dactyloides</i> (Nutt.) Engelm.	Buffalo Grass
<i>Calamagrostis canadensis</i> (Michx.) Beauv.	Bluejoint (D)
<i>Calamovilfa longifolia</i> (Hook.) Scribn.	Prairie Sandreed (D)
<i>Cenchrus longispinus</i> (Hack.) Fern	Field Sandbur
[= <i>Cenchrus pauciflorus</i> Benth.]	
<i>Dactylis glomerata</i> L.	Orchardgrass
<i>Danthonia spicata</i> (L.) Beauv. ex R. & S.	Poverty Oatgrass (D)
<i>Deschampsia cespitosa</i> (L.) Beauv.	Tufted Hairgrass (D)
<i>Dichanthelium linearifolium</i> (Wash.) Gould	Elongate Panicum
[= <i>Panicum perlongum</i> Nash]	
<i>Dichanthelium oligosanthes</i> (Schultz) Gould	Small Panicgrass
[= <i>Panicum oligosanthes</i> Schult.	
var. <i>scribnerianum</i> (Wash.) Fern]	
<i>Distichlis spicata</i> (L.) Greene	
var. <i>stricta</i> (Torr.) Beetle	Inland Salt Grass (D)
<i>Echinochloa crusgallii</i> (L.) Beauv.	Barnyard Grass
<i>Elymus canadensis</i> L.	Canada Wild Rye
<i>Eragrostis cilianensis</i> (All.) E. Mosher	Stinkgrass (D)
<i>Festuca octoflora</i> Walt.	Six-weeks Fescue
[= <i>Vulpia octoflora</i> (Walt.) Rydb.]	
<i>Festuca pratensis</i> Huds.	Meadow Fescue
<i>Glyceria grandis</i> Wats.	Tall Mannagrass
[= <i>Glyceria maxima</i> (Hart.) Holmb.	
ssp. <i>grandis</i> Wats.]	
<i>Glyceria striata</i> (Lam.) Hitchc.	Fowl Mannagrass

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SCIENTIFIC NAME

COMMON NAME

Hordeum jubatum L.
Koeleria pyramidata (Lam.) Beauv.
 [= *Koeleria gracilis* Pers.]
 [= *Koeleria macrantha* (Ledeb.) Schultes]
Muhlenbergia montana (Nutt.) Hitchc.
Muhlenbergia racemosa (Michx.) B. S. P.
Muhlenbergia torreyi (Kunth) Hitchc.
Muhlenbergia wrightii Vasey
Oryzopsis hymenoides (R. & S.) Ricker
Panicum capillare L.
Munroa squarrosa (Nutt.) Torr.
Panicum capillare L.
Panicum virgatum L.
Phalaris arundinacea L.
Phleum pratense L.
Poa annua L.
Poa canbyi (Scribn.) Piper
Poa compressa L.
Poa fendleriana (Steud.) Vasey
Poa pratensis L.
 [= *Poa aggasizensis* Boivin & D. Love]
Polypogon monspeliensis (L.) Desf.
Schedonnardus paniculatus (Nutt.) Trel.
Secale cereale L.
Setaria glauca (L.) P. Beauv.
Setaria viridis (L.) Beauv.
Sitanion hystrix (Nutt.) Sm.
 [= *Sitanion longifolium* J. G. Smith]
Sorghastrum nutans (L.) Nash
 [= *Sorghastrum avenaceum* (Michx.) Nash]
Spartina pectinata Link
Sphenopholis obtusata (Michx.) Scribn.
Sporobolus cryptandrus (Torr.) A. Gray
Sporobolus heterolepis (A. Gray) A. Gray
Stipa comata Trin. & Rupr.
Stipa neomexicana (Thur. ex Vasey.) Scribn.
Stipa robusta (Vasey) Scribn.
Stipa viridula Trin.

Foxtail Barley
 Junegrass

 Mountain Muhly
 Marsh Muhly (D)
 Ring-grass Muhly (D)
 Spike Muhly (D)
 Indian Ricegrass (D)
 Witchgrass
 False Buffalo Grass (D)
 Common Witchgrass (D)
 Switchgrass
 Reed Canarygrass (D)
 Timothy
 Annual Bluegrass (D)
 Canby's Bluegrass
 Canada Bluegrass
 Muttongrass (D)
 Kentucky Bluegrass (D)

 Rabbitfoot Grass
 Tumblegrass
 Rye
 Smooth Bristle Grass (D)
 Green Foxtail
 Squirreltail (D)

 Indian Grass (D)

 Prairie Cordgrass
 Prairie Wedgegrass (D)
 Sand Dropseed
 Prairie Dropseed
 Needle-and-thread (D)
 New Mexico Feather Grass (D)
 Sleepy Grass (D)
 Green Needlegrass

TYPHACEAE (2 Species)

Cattail Family

Typha angustifolia L.
Typha latifolia L.

Narrow-leaved Cattail (D)
 Common Cattail

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SCIENTIFIC NAME

COMMON NAME

LILIACEAE (10 Species)

Allium cernuum Roth
Allium geyeri Wats.
Allium textile A. Nels. & Macbr.
Asparagus officinalis L.
Calochortus gunnisonii Wats.
Leucocrinum montanum Nutt.
Smilacina racemosa (L.) Desf.
Smilacina stellata (L.) Desf.
Zigadenus elegans Pursh.
Zigadenus venenosus Wats.

Lily Family

Nodding Wild Onion
 Geyer's Onion (D)
 Wild White Onion
 Asparagus
 Sego Lily
 Sand Lily
 False Solomon's Seal (D)
 Spikenard
 White Camas (D)
 Death Camas

IRIDACEAE (2 Species)

Iris missouriensis Nutt.
Sisyrinchium montanum Greene

Iris Family

Blue Flag
 Blue-eyed Grass

AGAVACEAE (1 Species)

Yucca glauca Nutt.

Agave Family

Yucca

ORCHIDACEAE (1 Species)

Habenaria hyperborea (L.) R. Br.

Orchid Family

Northern Green Orchis (D)

Total Number of Plant Species = 532

1) Flora of the Great Plains (GPFA 1991) was used for scientific and common names. 2) Species documented during the Baseline Study, but not previously recorded at RFP are designated by a (D).

Terrestrial Arthropods Taxa List, Rocky Flats Plant, 1991

SCIENTIFIC NAME (1)	COMMON NAME
<u>Order Isopoda (1 Family, 1 Taxon)</u>	<u>Pillbugs</u>
ARMADILLIDIIDAE	
<u>Order Diplopoda (1 Family, 1 Taxon)</u>	<u>Millipedes</u>
POLYDESMOIDAE	
<u>Order Ephemeroptera (1 Family, 2 Taxa)</u>	<u>Mayflies</u>
BAETIDAE	
<i>Caelobaetis spp.</i>	
<i>Callibaetis spp.</i>	
<u>Order Odonata (1 Family, 2 Taxa)</u>	<u>Dragonflies/Damselflies</u>
COENAGRIONIDAE	
<i>Ichana spp.</i>	
<i>Enallagma spp.</i>	
<u>Order Orthoptera (4 Families, 9 Taxa)</u>	<u>Grasshoppers/Crickets</u>
ACRIDIDAE	
<i>Acrolophus spp.</i>	
<i>Amphiornus spp.</i>	
<i>Dissosteira spp.</i>	
<i>Melanoplus spp.</i>	
<i>Mermiria spp.</i>	
GRYLLIDAE	
<i>Oecanthus spp.</i>	
MANTIDAE (2)	
<i>Yersiniops spp.</i>	

Terrestrial Arthropods Taxa List, Rocky Flats Plant, 1991

SCIENTIFIC NAME (1)	COMMON NAME
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TETTIGONIIDAE

*Conocephalus spp.**Scudderia spp.*Order Psocoptera (1 Family, 1 Taxon)Barklice

PSOCIDAE

Order Dermaptera (1 Family, 1 Taxon)Earwigs

FORFICULIDAE

*Forficula spp.*Order Coleoptera (20 Families, 33 Taxa)Beetles

ANTHICIDAE

BUPRESTIDAE

Agrilus spp.

CANTHARIDAE

Chauliognathus spp.

CARABIDAE

CERAMBYCIDAE

*Megacyllene spp.**Tetraopes spp.*

CHRYSOMELIDAE

*Alticinae spp.**Blepharia spp.*

Terrestrial Arthropods Taxa List, Rocky Flats Plant, 1991

SCIENTIFIC NAME (1)	COMMON NAME
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CHLAMISINAE

Chrysolina spp.
Cryptocephalus spp.
Diabrotica spp.
Disonycha spp.
Jonthonota spp.
Monoxia spp.
Trivhabda spp.

CLERIDAE

COCCINELLIDAE

Coccinella spp.
Hippodamia spp.

CURCULIONIDAE

Hypera spp.
Rhinocyllus spp.

HYDROPHILIDAE

LAMPYRIDAE

MELANDRYIDAE

MELOIDAE

MORDELLIDAE

NITIDULIDAE

PHALACRIDAE

SCAPHIDIIDAE

Onthophagus spp.
Trox spp.

Terrestrial Arthropods Taxa List, Rocky Flats Plant, 1991

SCIENTIFIC NAME (1)	COMMON NAME
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SILPHIDAE

Heterosilpha spp.

Nicrophorus spp.

Thanatophilus spp.

STAPHYLINIDAE

Order Thysanoptera (1 Family, 1 Taxon)

Thrips

THRIPIDAE

Order Hemiptera (13 Families, 16 Taxa)

True Bugs

ALYDIDAE

Alydus spp.

Megalotomus spp.

ANTHOCORIDAE

BERYTIDAE

Jahysius spp.

COREIDAE

LYGAEIDAE

Lygaeus spp.

MIRIDAE

NABIDAE

Nabacula spp.

Nabis spp.

PENTATOMIDAE

Podisus spp.

Terrestrial Arthropods Taxa List, Rocky Flats Plant, 1991

SCIENTIFIC NAME (1)	COMMON NAME
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REDUVIIDAE

*Phymata spp.**Sinea spp.*

RHOPALIDAE

SCUTELLERIDAE

Homaemus spp.

THYREOCORIDAE

Corimelaena spp.

TINGIDAE

Order Homoptera (9 Families, 11 Taxa)Aphids/Scale Insects

APHIDIDAE

CERCOPIDAE

CICADELLIDAE

*Dorycephalus spp.**Oncometopia spp.*

CIXIIDAE

DELPHACIDAE

DICTYOPHARIDAE

ISSIDAE

MEMBRACIDAE

*Publilia spp.**Stictocephala spp.*

Terrestrial Arthropods Taxa List, Rocky Flats Plant, 1991

SCIENTIFIC NAME (1)	COMMON NAME
PSYLLIDAE	
<u>Order Neuroptera (4 Families, 4 Taxa)</u>	<u>Lacewings/Antlions</u>
CHLOROPIDAE	
CHRYSOPIIDAE	
HEMEROBIIDAE	
MYRMELEONTIDAE	
<u>Order Trichoptera (1 Family, 1 Taxon)</u>	<u>Caddisflies</u>
HYDROPSYCHIDAE	
<i>Cheumatopsyche spp.</i>	
<u>Order Lepidoptera (15 Families, 61 Taxa)</u>	<u>Butterflies/Moths</u>
ARCTIIDAE	
APATURIDAE	
<i>Anaea andria</i>	Goatweed Butterfly
<i>Asterocampa celtis</i>	Hackberry Butterfly
DANAIDAE	
<i>Danaus plexippus</i>	Monarch
GEOMETRIDAE	
HESPERIIDAE	
<i>Atrytone logan</i>	Delaware Skipper
<i>Hesperia viridis</i>	Green Skipper
<i>Piruna pirus</i>	Pirus Skipperling
<i>Poanes taxiles</i>	Taxiles Skipper
<i>Polites peckius</i>	Peck's Skipper
<i>Epargyreus clarus</i>	Silver-spotted Skipper
<i>Erynnis afranius</i>	Afranius Dusky-wing

Terrestrial Arthropods Taxa List, Rocky Flats Plant, 1991

SCIENTIFIC NAME (1)	COMMON NAME
<i>Oarisma garita</i>	Garita Skipperling
<i>Pholisora catullus</i>	Common Sooty-wing
<i>Poanes taxiles</i>	Taxiles Skipper
<i>Pyrgus communis</i>	Common Checkered Skipper

LYCAENIDAE

<i>Satyrium acadicum</i>	Acadian Hairstreak
<i>Strymon melinus</i>	Common Hairstreak
<i>Lycaena helloides</i>	Purplish Copper
<i>Lycaena heteronea</i>	Varied Blue
<i>Lycaena hyllus</i>	Bronze Copper
<i>Lycaena rubida</i>	Ruddy Copper
<i>Lycaena xanthoides</i>	Great Copper
<i>Hemiargus isolus (isola)</i>	Reakirt's Blue
<i>Leptotes marina</i>	Marine Blue
<i>Lycaeides melissa</i>	Melissa Blue
<i>Plebejus acmon</i>	Acmon Blue
<i>Plebejus icarioides</i>	Boisduval's Blue
<i>Plebejus saepiolus</i>	Greenish Blue

NOCTUIDAE

NYMPHALIDAE

<i>Chlosyne gorgone</i>	Gorgone Checkerspot
<i>Euptoieta claudia</i>	Variegated Fritillary
<i>Junonia coenia</i>	Buckeye
<i>Limenitis archipus</i>	Viceroy
<i>Nymphalis antiopa</i>	Mourning Cloak
<i>Nymphalis milberti</i>	Milbert's Tortoise-shell
<i>Phyciodes pictus</i>	Painted Crescent
<i>Phyciodes tharos</i>	Northern Pearl Crescent
<i>Speyeria aphrodite</i>	Aphrodite
<i>Speyeria atlantis</i>	Atlantis Fritillary
<i>Speyeria coronis</i>	Crown Fritillary
<i>Speyeria edwardsii</i>	Edwards' Fritillary
<i>Vanessa atalanta</i>	Red Admiral
<i>Vanessa cardui</i>	Painted Lady

Terrestrial Arthropods Taxa List, Rocky Flats Plant, 1991

SCIENTIFIC NAME (1)	COMMON NAME
PAPILIONIDAE	
<i>Papilio multicaudatus</i>	Two-tailed Swallowtail
<i>Papilio polyxenes</i>	Black Swallowtail
<i>Papilio rutulus</i>	Western Tiger Swallowtail
<i>Parnassius phoebus</i>	Phoebus Parnassian
PIERIDAE	
<i>Colias eurytheme</i>	Orange Sulfur
<i>Colias philodice</i>	Clouded Sulfur
<i>Nathalis iole</i>	Dainty Sulfur
<i>Pieris repae</i>	Cabbage Butterfly
<i>Pontia occidentalis</i>	Western White
<i>Pontia protodice</i>	Checkered White
PTEROPHORIDAE	
PYRALIDAE	
SATURNIIDAE	
<i>Automeris io</i>	Io Moth
SATYRIDAE	
<i>Cercyonis oetus</i>	Least Satyr
<i>Cercyonis pegala</i>	Wood Nymph
<i>Coenonympha ochracea</i>	Ochre Ringlet
TORTRICIDAE	
<u>Order Diptera (38 Families, 38 Taxa)</u>	<u>Flies</u>
ACROCERIDAE	
AGROMYZIDAE	
ANTHOMYIIDAE	
ASILIDAE	

Terrestrial Arthropods Taxa List, Rocky Flats Plant, 1991

SCIENTIFIC NAME (1)	COMMON NAME
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BOMBYLIIDAE	
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CALLIPHORIDAE	
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CECIDOMYIIDAE	
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CERATOPOGONIDAE	
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CHIRONOMIDAE	
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CHLOROPIDAE	
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CONOPIDAE	
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CULICIDAE	
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DOLICHOPODIDAE	
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EMPIDIDAE	
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EPHYDRIDAE	
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HELEOMYZIDAE	
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HIPPOBOSCIDAE	
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LAUXANIIDAE	
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MICROPEZIDAE	
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MUSCIDAE	
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MYCETOPHILIDAE	
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OTITIDAE	
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PHORIDAE	
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PIPUNCULIDAE	
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RHAGIONIDAE	
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Terrestrial Arthropods Taxa List, Rocky Flats Plant, 1991

SCIENTIFIC NAME (1)	COMMON NAME
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RICHARDIIDAE	
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SARCOPHAGIDAE	
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SCIARIDAE	
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SCIOMYZIDAE	
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SEPSIDAE	
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SIMULIIDAE	
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STRATIOMYIDAE	
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SYRPHIDAE	
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TABANIDAE	
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<i>Chrysops spp.</i>	
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TACHINIDAE	
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TEPHRITIDAE	
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THEREVIDAE	
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TIPULIDAE	
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<u>Order Hymenoptera (16 Families, 17 Taxa)</u>	<u>Ants/Wasps/Bees</u>
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ANDRENIDAE	
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ANTHOPHORIDAE	
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APIDAE	
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<i>Apis spp.</i>	
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<i>Bombus spp.</i>	
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BETHYLIDAE	
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Terrestrial Arthropods Taxa List, Rocky Flats Plant, 1991

SCIENTIFIC NAME (1)	COMMON NAME
BRACONIDAE	
<i>Chelonus spp.</i>	
CHALCIDOIDAE	
CHRYSIDIDAE	
COLLETIDAE	
<i>Hylaeus spp.</i>	
FORMICIDAE	
<i>Camponotus spp.</i>	
HALICTIDAE	
<i>Sphecodes spp.</i>	
ICHNEUMONIDAE	
SCELIONIDAE	
SPHECIDAE	
TENTHREDINIDAE	
TIPHIIDAE	
VESPIDAE	
<i>Dolichovespula spp.</i>	
<u>Order Aranae (1 Family, 1 Taxon)</u>	<u>Spiders</u>
ARANEIDAE	
<i>Araneus spp.</i>	

Terrestrial Arthropods Taxa List, Rocky Flats Plant, 1991

SCIENTIFIC NAME (1)	COMMON NAME
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<u>Order Opiliones (1 Family, 1 Taxon)</u>	<u>Daddy Long-legs</u>
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PHALANGIIDAE

<u>Order Acarina (2 Families, 1 Taxon)</u>	<u>Ticks</u>
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IXODIDAE

<u>Order Solpugida (1 Family, 1 Taxon)</u>	<u>Wind-Scorpions</u>
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EREMOBATIDAE

Total Number of Arthropod Orders = 20; Families = 131; Taxa = 200

(1) Taxonomic identifications were made by Dr. Boris Kondratieff and Mike Weissmann of Colorado State University, Fort Collins, CO.

(2) Mantids are recognized by some authorities as members of the separate Order Mantodea.

Amphibians Species List, Rocky Flats Plant, 1991

SCIENTIFIC NAME	COMMON NAME
AMBYSTOMATIDAE (1 Species)	SALAMANDERS
<i>Ambystoma tigrinum</i>	Tiger Salamander
PELOBATIDAE (1 Species)	SPADEFOOT TOADS
<i>Scaphiophus bombifrons</i> (1)	Plains Spadefoot
BUFONIDAE (2 Species)	TRUE TOADS
<i>Bufo cognatus</i> (1)	Great Plains Toad
<i>Bufo woodhousei</i>	Woodhouse's Toad
HYLIDAE (1 Species)	TREE FROGS
<i>Pseudacris triseriatus</i>	Boreal Chorus Frog
RANIDAE (1 Species)	TRUE FROGS
<i>Rana pipiens</i>	Northern Leopard Frog
Total Number of Amphibian Species = 6	

(1) Species was previously recorded, but not observed during 1991 field season.

Reptiles Species List, Rocky Flats Plant, 1991

SCIENTIFIC NAME	COMMON NAME
CHELYRIDAE (1 Species)	TURTLES
<i>Chrysemys picta</i>	Western Painted Turtle
IGUANIDAE (2 Species)	LIZARDS
<i>Phrynosoma doulassi</i>	Short-horned Lizard
<i>Sceloporus undulatus</i>	Eastern Fence Lizard
COLUBRIDAE (4 Species)	COLUBRIDS
<i>Coluber constrictor</i>	Racer
<i>Pituophis melanoleucus</i>	Bull Snake
<i>Thamnophis radix</i>	Plains Garter Snake
<i>Thamnophis sirtalis</i>	Common Garter Snake
VIRERIDAE (1 Species)	VIPERS
<i>Crotalis viridis</i>	Prairie Rattlesnake
Total Number of Reptile Species = 8	

Bird Species List, Rocky Flats Plant, 1991-1992

SCIENTIFIC NAME (1)	COMMON NAME
PODICIPEDIDAE (1 Species)	GREBES
<i>Podilymbus podiceps</i>	Pied-billed Grebe
PHALACROCORACIDAE (1 Species)	CORMORANTS
<i>Phalacrocorax auritus</i>	Double-crested Cormorant
ARDEIDAE (3 Species)	HERONS
<i>Ardea herodias</i>	Great Blue Heron
<i>Butorides striatus</i>	Green-backed Heron
<i>Nycticorax nycticorax</i>	Black-crowned Night-heron
ANATIDAE (17 Species)	GEESE AND DUCKS
<i>Branta canadensis</i>	Canada Goose
<i>Chen caerulescens</i>	Snow Goose
<i>Anas platyrhynchos</i>	Mallard
<i>Anas strepera</i>	Gadwall
<i>Anas acuta</i>	Northern Pintail
<i>Anas crecca</i>	Green-winged Teal
<i>Anas discors</i>	Blue-winged Teal
<i>Anas cyanoptera</i>	Cinnamon Teal
<i>Anas clypeata</i>	Northern Shoveler
<i>Aythya americana</i>	Redhead
<i>Aythya collaris</i>	Ring-necked Duck
<i>Aythya valisineria</i>	Canvasback
<i>Aythya affinis</i>	Lesser Scaup
<i>Bucephala clangula</i>	Common Goldeneye
<i>Bucephala albeola</i>	Bufflehead
<i>Lophodytes cucullatus</i>	Hooded Merganser
<i>Mergus merganser</i>	Common Merganser
CATHARTIDAE (1 Species)	AMERICAN VULTURES
<i>Cathartes aura</i>	Turkey Vulture

(1) Scientific and common names were obtained from The AOU Checklist of North American Birds (6TH Ed.).

Bird Species List, Rocky Flats Plant, 1991-1992

SCIENTIFIC NAME (1)	COMMON NAME
ACCIPITRIDAE (9 Species)	EAGLES AND HAWKS
<i>Accipiter striatus</i>	Sharp-shinned Hawk
<i>Accipiter cooperii</i>	Cooper's Hawk
<i>Buteo jamaicensis</i>	Red-tailed Hawk
<i>Buteo swainsoni</i>	Swainson's Hawk
<i>Buteo lagopus</i>	Rough-legged Hawk
<i>Buteo regalis</i>	Ferruginous Hawk
<i>Aquila chrysaetos</i>	Golden Eagle
<i>Haliaeetus leucocephalus</i>	Bald Eagle
<i>Circus cyaneus</i>	Northern Harrier
FALCONIDAE (4 Species)	FALCONS
<i>Falco mexicanus</i>	Prairie Falcon
<i>Falco peregrinus</i>	Peregrine Falcon
<i>Falco columbarius</i>	Merlin
<i>Falco sparverius</i>	American Kestrel
PHASIANIDAE (2 Species)	GROUSE AND TURKEYS
<i>Phasianus colchicus</i>	Ring-necked Pheasant
<i>Meleagris gallopavo</i>	Wild Turkey
RALLIDAE (3 Species)	RAILS AND COOTS
<i>Rallus limicola</i>	Virginia Rail
<i>Porzana carolina</i>	Sora Rail
<i>Fulica americana</i>	American coot
GRUIDAE (1 Species)	CRANES
<i>Grus canadensis</i>	Sandhill Crane
CHARADRIIDAE (1 Species)	PLOVERS
<i>Charadrius vociferus</i>	Killdeer

(1) Scientific and common names were obtained from The AOU Checklist of North American Birds (6TH Ed.).

Bird Species List, Rocky Flats Plant, 1991-1992

SCIENTIFIC NAME (1)	COMMON NAME
SCOLOPACIDAE (6 Species)	SANDPIPERS AND ALLIES
<i>Catoptrophorus semipalmatus</i>	Willet
<i>Tringa solitaria</i>	Solitary Sandpiper
<i>Actitis macularia</i>	Spotted Sandpiper
<i>Limnodromus scolopaceus</i>	Long-billed Dowitcher
<i>Gallinago gallinago</i>	Common Snipe
<i>Calidris melanotos</i>	Pectoral Sandpiper
COLUMBIDAE (3 Species)	PIGEONS AND DOVES
<i>Columba fasciata</i>	Band-tailed Pigeon
<i>Columba livia</i>	Rock Dove
<i>Zenaidura macroura</i>	Mourning Dove
STRIGIDAE (3 Species)	OWLS
<i>Bubo virginianus</i>	Great Horned Owl
<i>Asio otus</i>	Long-eared Owl
<i>Asio flammeus</i>	Short-eared Owl
LARIDAE (1 Species)	GULLS
<i>Larus delawarensis</i>	Ring-billed Gull
CAPRIMULGIDAE (1 Species)	NIGHT JARS
<i>Chordeiles minor</i>	Common Nighthawk
TROCHILIDAE (2 Species)	HUMMINGBIRDS
<i>Selasphorus platycercus</i>	Broad-tailed Hummingbird
<i>Selasphorus rufus</i>	Rufous Hummingbird
ALCEDINIDAE (1 Species)	KINGFISHERS
<i>Ceryle alcyon</i>	Belted Kingfisher

(1) Scientific and common names were obtained from The AOU Checklist of North American Birds (6TH Ed.).

Bird Species List, Rocky Flats Plant, 1991-1992

SCIENTIFIC NAME (1)	COMMON NAME
PICIDAE (4 Species)	WOODPECKERS
<i>Colaptes auratus</i>	Northern Flicker
<i>Sphyrapicus nuchalis</i>	Red-naped Sapsucker
<i>Picoides villosus</i>	Hairy Woodpecker
<i>Picoides pubescens</i>	Downy Woodpecker
TYRANNIDAE (10 Species)	TYRANT FLYCATCHERS
<i>Tyrannus tyrannus</i>	Eastern Kingbird
<i>Tyrannus verticalis</i>	Western Kingbird
<i>Sayornis phoebe</i>	Eastern Phoebe
<i>Sayornis saya</i>	Say's Phoebe
<i>Empidonax traillii</i>	Willow Flycatcher
<i>Empidonax hammondi</i>	Hammond's Flycatcher
<i>Empidonax oberholseri</i>	Dusky Flycatcher
<i>Empidonax difficilis</i>	Western Flycatcher
<i>Contopus sordidulus</i>	Western Wood-Pewee
<i>Contopus borealis</i>	Olive-sided Flycatcher
ALAUDIDAE (1 Species)	LARKS
<i>Eremophila alpestris</i>	Horned Lark
HIRUNDINIDAE (5 Species)	SWALLOWS
<i>Tachycineta thalassina</i>	Violet-green Swallow
<i>Tachycineta bicolor</i>	Tree Swallow
<i>Steigodopteryx serripennis</i>	Northern Rough-winged Swallow
<i>Hirundo rustica</i>	Barn Swallow
<i>Hirundo pyrrhonota</i>	Cliff Swallow
CORVIDAE (5 Species)	CROWS, JAYS, MAGPIES
<i>Cyanocitta cristata</i>	Blue Jay
<i>Pica pica</i>	Black-billed Magpie
<i>Corvus corax</i>	Common Raven
<i>Corvus brachyrhynchos</i>	American Crow
<i>Gymnorhinus cyanocephalus</i>	Pinyon Jay

(1) Scientific and common names were obtained from The AOU Checklist of North American Birds (6TH Ed.).

Bird Species List, Rocky Flats Plant, 1991-1992

SCIENTIFIC NAME (1)	COMMON NAME
PARIDAE (1 Species)	TITMICE
<i>Parus atricapillus</i>	Black-capped Chickadee
SITIDAE (1 Species)	NUTHATCHES
<i>Sitta carolinensis</i>	White-breasted Nuthatch
TROGLODYTIDAE (4 Species)	WRENS
<i>Troglodytes aedon</i>	House Wren
<i>Troglodytes troglodytes</i>	Winter Wren
<i>Cistothorus palustris</i>	Marsh Wren
<i>Salpinctes obsoletus</i>	Rock Wren
MUSCICAPIDAE (5 Species)	MUSCICAPIDS
<i>Regulus calendula</i>	Ruby-crowned Kinglet
<i>Sialia currucoides</i>	Mountain Bluebird
<i>Myadestes townsendi</i>	Townsend's Solitaire
<i>Catharus ustulatus</i>	Swainson's Thrush
<i>Turdus migratorius</i>	American Robin
MIMIDAE (2 Species)	THRASHERS
<i>Dumetella carolinensis</i>	Gray Catbird
<i>Oreoscoptes montanus</i>	Sage Thrasher
LANIIDAE (1 Species)	SHRIKES
<i>Lanius ludovicianus</i>	Loggerhead Shrike
<i>Lanius excubitor</i>	Northern Shrike
STURNIDAE (1 Species)	STARLINGS
<i>Sturnus vulgaris</i>	European Starling

(1) Scientific and common names were obtained from The AOU Checklist of North American Birds (6TH Ed.).

Bird Species List, Rocky Flats Plant, 1991-1992

SCIENTIFIC NAME (1)	COMMON NAME
VIREONIDAE (2 Species)	VIREOS
<i>Vireo solitarius</i>	Solitary Vireo
<i>Vireo gilvus</i>	Warbling Vireo
PARULINAE (7 Species)	WOOD WARBLERS
<i>Dendroica petechia</i>	Yellow Warbler
<i>Dendroica coronata</i>	Yellow-rumped Warbler
<i>Dendroica townsendi</i>	Townsend's Warbler
<i>Opornis tolmiei</i>	MacGillivray's Warbler
<i>Geothlypis trichas</i>	Common Yellowthroat
<i>Icteria virens</i>	Yellow-breasted Chat
<i>Wilsonia pusilla</i>	Wilson's Warbler
THRAUPINAE (1 Species)	TANAGERS
<i>Piranga ludoviciana</i>	Western Tanager
CARDINALINAE (4 Species)	GROSBEAKS AND ALLIES
<i>Pheucticus melanocephalus</i>	Black-headed Grosbeak
<i>Guiraca caerulea</i>	Blue Grosbeak
<i>Passerina cyanea</i>	Indigo Bunting
<i>Passerina amoena</i>	Lazuli Bunting
EMBERIZINAE (16 Species)	TOWHEES AND SPARROWS
<i>Pipilo chlorurus</i>	Green-tailed Towhee
<i>Pipilo erythrophthalmus</i>	Rufous-sided Towhee
<i>Ammodramus savannarum</i>	Grasshopper Sparrow
<i>Poocetes gramineus</i>	Vesper Sparrow
<i>Passerculus sandwichensis</i>	Savannah Sparrow
<i>Melospiza melodia</i>	Song Sparrow
<i>Chondestes grammacus</i>	Lark sparrow
<i>Spizella arborea</i>	American Tree Sparrow
<i>Spizella passerina</i>	Chipping Sparrow
<i>Spizella pallida</i>	Clay-colored Sparrow
<i>Spizella breweri</i>	Brewer's Sparrow
<i>Junco hyemalis</i>	Dark-eyed Junco
<i>Zonotrichia querula</i>	Harris's Sparrow

(1) Scientific and common names were obtained from The AOU Checklist of North American Birds (6TH Ed.).

Bird Species List, Rocky Flats Plant, 1991-1992

SCIENTIFIC NAME (1)	COMMON NAME
<i>Zonotrichia leucophrys</i>	White-crowned Sparrow
<i>Melospiza lincolnii</i>	Lincoln's Sparrow
<i>Calcarius lapponicus</i>	Lapland Longspur
AGELAIINI (7 Species)	MEADOWLARKS, BLACKBIRDS
<i>Sturnella neglecta</i>	Western Meadowlark
<i>Xanthocephalus xanthocephalus</i>	Yellow-headed Blackbird
<i>Agelaius phoeniceus</i>	Red-winged Blackbird
<i>Euphagus cyanocephalus</i>	Brewer's Blackbird
<i>Quiscalus quiscula</i>	Common Grackle
<i>Molothrus ater</i>	Brown-headed Cowbird
<i>Icterus galbula</i>	Northern Oriole
PASSERIDAE (1 Species)	OLD WORLD SPARROWS
<i>Passer domesticus</i>	House Sparrow
CARDUELINAE (5 Species)	FINCHES
<i>Carduelis pinus</i>	Pine Siskin
<i>Carduelis tristis</i>	American Goldfinch
<i>Carduelis psaltria</i>	Lesser Goldfinch
<i>Carpodacus cassinii</i>	Cassin's Finch
<i>Carpodacus mexicanus</i>	House Finch
Total Number of Bird Species = 144	

(1) Scientific and common names were obtained from The AOU Checklist of North American Birds (6TH Ed.).

Mammals Species List, Rocky Flats Plant, 1991-1992

SCIENTIFIC NAME	COMMON NAME
INSECTIVORA (2 Species)	INSECT-EATERS
<i>Sorex merriami</i>	Merriam's Shrew
<i>Sorex palustris</i>	Water Shrew
CARNIVORA (6 Species)	CARNIVORES
<i>Canis latrans</i>	Coyote
<i>Vulpes vulpes</i>	Red Fox
<i>Procyon lotor</i>	Raccoon
<i>Mustela frenata</i>	Long-tailed Weasel
<i>Taxidea taxus</i>	Badger
<i>Mephitis mephitis</i>	Striped Skunk
RODENTIA (17 Species)	RODENTS
<i>Spermophilus tridecemlineatus</i>	Thirteen-lined Ground Squirrel
<i>Cynomys ludovicianus</i>	Black-tailed Prairie Dog
<i>Sciurus niger</i>	Fox Squirrel
<i>Thomomys talpoides</i>	Northern Pocket Gopher
<i>Perognathus flavus</i>	Silky Pocket Mouse
<i>Perognathus hispidus</i>	Hispid Pocket Mouse
<i>Castor canadensis</i> (1)	Beaver
<i>Reithrodontomys montanus</i>	Plains Harvest Mouse
<i>Reithrodontomys megalotis</i>	Western Harvest Mouse
<i>Peromyscus maniculatus</i>	Deer Mouse
<i>Neotoma mexicana</i>	Mexican Wood Rat
<i>Microtus pennsylvanicus</i>	Meadow Vole
<i>Microtus ochrogaster</i>	Prairie Vole
<i>Ondatra zibethicus</i>	Muskrat
<i>Zapus hudsonius</i>	Meadow Jumping Mouse
<i>Zapus princeps</i>	Western Jumping Mouse
<i>Erethizon dorsatum</i>	Porcupine
LAGOMORPHA (3 Species)	RABBITS AND HARES
<i>Lepus townsendii</i>	White-tailed Jackrabbit
<i>Lepus californicus</i>	Black-tailed Jackrabbit
<i>Sylvilagus audubonii</i>	Desert Cottontail
ARTIODACTYLA (3 Species)	DEER
<i>Cervus elephus</i>	Elk (Wapiti)
<i>Odocoileus hemionus</i>	Mule Deer
<i>Odocoileus virginianus</i>	White-tailed Deer

Total Number of Mammal Species = 31

(1) Species was previously recorded, but was not observed during 1991 field season.

APPENDIX C

ECOSYSTEM DATA

HABITAT TYPE: Xeric Mixed Grassland, Reference, 1991 Final (BLTXR91F)

[illegible]

[illegible]

FORBS										
<i>Achillea millefolium</i>					x	x	x	x	x	x
<i>Agoseris glauca</i>							x			
<i>Allium textile</i>	x	x	x	x	x	x	x	x	x	x
<i>Alyssum alyssoides</i>		x			x	x		x		x
<i>Alyssum minus</i>	x	x	x	x	x	x		x	x	x
<i>Ambrosia psilostachya</i>	x	x		x	x	x	x	x	x	x
<i>Antennaria parvifolia</i>			x	x			x			
<i>Arenaria fendleri</i>	x	x	x	x	x	x	x	x	x	x
<i>Arnica fulgens</i>	x	x	x	x	x		x	x	x	
<i>Artemisia campestris</i>	x	x	x	x	x	x	x	x	x	x
<i>Artemisia dracunculul</i>	x		x				x	x	x	x
<i>Artemisia frigida</i>	x	x	x	x	x	x	x	x	x	x
<i>Artemisia ludoviciana</i>	x	x	x	x	x	x	x	x	x	x
<i>Asclepias viridiflora</i>	x				x			x		x
<i>Aster porteri</i>	x	x	x	x	x	x	x	x	x	x
<i>Astragalus sp.</i>					x	x				
<i>Calochortus gunnisonii</i>									x	
<i>Calylophus serrulatus</i>										x
<i>Carduus nutans</i>		x					x	x		
<i>Castilleja sessiliflora</i>			x	x	x				x	x
<i>Centaurea diffusa</i>				x						x
<i>Chrysopsis fulcrata</i>			x	x			x	x	x	x
<i>Chrysopsis villosa</i>	x	x	x	x	x	x	x	x	x	x
<i>Cirsium undulatum</i>	x	x				x				x
<i>Collomia linearis</i>	x	x			x			x	x	x
<i>Comandra umbellata</i>			x					x		
<i>Crepis runcinata</i>				x						
<i>Dalea purpurea</i>	x	x	x	x	x	x	x	x	x	x
<i>Erigeron flagellaris</i>	x	x			x	x	x	x	x	x
<i>Eriogonum alatum</i>	x	x	x	x	x	x	x	x	x	x
<i>Erysimum asperum</i>		x			x	x	x	x		
<i>Gaillardia aristata</i>	x	x	x	x	x	x	x	x	x	x
<i>Gaura coccinea</i>									x	
<i>Grindelia squarrosa</i>	x	x		x	x	x	x	x	x	x
<i>Gutierrezia sarothrae</i>	x	x		x	x	x	x		x	
<i>Harbouria trachypleura</i>								x		
<i>Hedeoma hispidum</i>		x		x				x		
<i>Helianthus pumilus</i>	x				x	x	x		x	x
<i>Hymenopappus filifolius</i>									x	x
<i>Hypericum perforatum</i>	x	x	x	x	x	x	x	x	x	x
<i>Kuhnia eupatorioides</i>							x			
<i>Lactuca serriola</i>	x	x					x			
<i>Lesquerella montana</i>							x			
<i>Liatris punctata</i>	x	x	x	x	x	x	x	x	x	x
<i>Linaria dalmatica</i>							x	x		
<i>Lomatium orientale</i>	x	x	x	x	x	x	x	x	x	x
<i>Mirabilis linearis</i>						x		x	x	x
<i>Onosmodium molle</i>							x			
<i>Orobanche fasciculata</i>	x	x	x	x	x	x		x		x
<i>Oxytropis lambertii</i>					x	x		x		x
<i>Paronychia jamesii</i>	x		x	x	x	x	x	x	x	x

<i>Penstemon secundiflorus</i>							x			
<i>Phacelia heterophylla</i>	x	x				x	x	x	x	
<i>Physalis heterophylla</i>					x	x				
<i>Polygala</i> (?)			x	x			x			
<i>Potentilla gracilis</i>	x	x								
<i>Psoralea tenuiflora</i>	x	x			x	x	x	x	x	
<i>Scorzonera lanciniata</i>							x	x		
<i>Sedum lanceolatum</i>			x	x	x					
<i>Senecio plattensis</i>			x	x			x			
<i>Senecio spartioides</i>		x					x	x	x	
<i>Solidago nemoralis</i>			x	x	x		x	x		
<i>Swertia radiata</i>							x			
<i>Tradescantia occidentalis</i>		x		x	x					
<i>Tragopogon dubius</i>					x	x	x	x	x	
<i>Vaccaria pyramidata</i>							x	x	x	
Total Plant Species Present	49	54	38	44	56	53	52	62	52	54

HABITAT TYPE: Xeric Mixed Grass, Affected, 1991 Final (BLTXA91F)

[illegible]

[illegible]

[illegible]

Belt Transect Summary Form

HABITAT TYPE: Mesic Mixed Grassland, Reference, 1991 Final (BLTGR91F)

[illegible]

[illegible]

FORBS										
<i>Achillea millefolium</i>		x	x		x		x	x	x	x
<i>Agoseris glauca</i>						x				
<i>Alyssum alyssoides</i>	x			x						
<i>Alyssum minus</i>	x	x			x	x	x	x	x	x
<i>Ambrosia psilostachya</i>				x	x	x	x	x		
<i>Anemone patens</i>					x					
<i>Apocynum cannabinum</i>						x				
<i>Arabis fendleri</i>	x									
<i>Arnica fulgens</i>				x				x		
<i>Artemisia campestris</i>	x	x	x	x	x	x	x		x	
<i>Artemisia dracunculus</i>						x	x	x		
<i>Artemisia frigida</i>	x	x	x	x	x	x		x		x
<i>Artemisia ludoviciana</i>					x	x		x		x
<i>Asclepias pumila</i>		x					x	x		
<i>Aster ericoides</i>				x					x	x
<i>Astragalus adsurgens</i>	x				x	x				
<i>Astragalus agrestis</i>		x								
<i>Astragalus flexuosus</i>		x							x	
<i>Astragalus shortianus</i>								x		
<i>Calylophus serrulatus</i>								x		
<i>Camelina microcarpa</i>		x								
<i>Carduus nutans</i>	x	x	x	x	x		x	x	x	x
<i>Castilleja sessiliflora</i>						x				
<i>Centaurea diffusa</i>							x	x		
<i>Centaurea repens</i>		x			x		x	x	x	
<i>Chenopodium leptophyllum</i>	x	x	x	x		x				
<i>Chrysopsis villosa</i>	x	x	x	x	x	x	x	x		
<i>Cirsium undulatum</i>		x		x	x		x		x	
<i>Collomia linearis</i>		x								x
<i>Convolvulus arvensis</i>						x	x	x		
<i>Conyza canadensis</i>	x	x	x		x	x				x
<i>Crepis runcinata</i>	x									
<i>Dalea candida</i>		x								
<i>Dalea purpurea</i>				x	x		x	x		
<i>Delphinium nuttalianum</i>									x	
<i>Delphinium virescens</i>	x	x		x	x	x				
<i>Descrurania pinnata</i>						x				
<i>Descrurania sophia</i>		x						x		
<i>Erigeron divergens</i>	x	x	x	x	x	x			x	x
<i>Erigeron flagellaris</i>		x					x	x	x	x
<i>Eriogonum alatum</i>	x			x						
<i>Erodium cicutarium</i>								x		
<i>Erysimum asperum</i>	x	x	x	x	x	x				
<i>Euphorbia robusta</i>					x				x	x
<i>Galium boreale</i>								x		
<i>Gaura coccinea</i>			x	x		x				
<i>Grindelia squarrosa</i>	x		x	x	x					
<i>Gutierrezia sarothrae</i>	x	x		x		x	x		x	x
<i>Hedeoma hispidum</i>			x	x	x	x				
<i>Helianthus annuus</i>	x	x	x	x	x			x	x	x
<i>Helianthus pumilus</i>		x			x		x			

Hypericum perforatum	x	x	x	x	x	x	x	x	x	
Kuhnia eupatorioides						x				x
Lactuca serriola	x	x	x	x	x	x	x	x	x	x
Lepidium campestre	x				x	x				
Liabris punctata	x		x	x					x	
Linaria dalmatica	x	x	x							
Linaria vulgaris					x					
Linum pereane	x	x				x				
Lippia cuneifolia							x			
Lithospermum incisum					x					
Lomatium orientale						x				
Mirabilis linearis				x			x	x		
Onosmodium molle					x	x	x	x		
Phacelia heterophylla					x	x	x	x		
Physalis virginiana						x	x			
Plantago lanceolata			x							
Plantago patagonica	x		x		x					
Psoralea tenuiflora	x	x	x	x	x	x	x	x	x	x
Ratibida columnifera	x	x	x	x	x			x		
Rumex mexicanus								x		
Scorzonera lanciniata							x	x	x	x
Senecio spartioides	x							x		
Sisymbrium altissimum						x				x
Sphaeralcea coccinea	x	x	x	x	x	x	x		x	x
Taraxacum officinale	x						x	x		
Tradescantia occidentalis	x	x	x	x	x	x				
Tragopogon dubius	x	x	x	x	x	x	x	x	x	x
Vaccaria pyramidata	x	x								
Verbascum blattaria				x			x	x		
Verbascum thapsus		x		x			x			
Verbena bracteata						x				
Vicia americana	x	x		x						x
Viola nuttallii							x			
(Crucifer 1)			x							
(Crucifer 2)			x							
(Unid. Onagraceae)				x						
Vicinity:										
Euphorbia marginata			x							
Scrophularia lanceolata		x								
Total Plant Species Present	44	48	40	43	49	47	52	59	32	27

HABITAT TYPE: Mesic Mixed Grassland, Affected, Final 1991 (BLTGA91F)

HABITAT TYPE: Mesic Mixed Grassland, Affected, Final 1991 (BLTGA91F)

[illegible]

[illegible]

FORBS										
Achillea millefolium				x	x					
Agoseris glauca				x	x					
Allium textile	x							x		
Alyssum alyssoides										x
Alyssum minus	x	x	x	x	x	x	x	x	x	x
Ambrosia psilostachya	x	x				x	x	x	x	x
Arabis fendleri									x	
Arabis hirsuta									x	
Artemisia campestris					x	x				x
Artemisia dracunculul					x	x				
Artemisia frigida		x					x	x		x
Artemisia ludoviciana	x	x	x	x	x	x	x	x	x	x
Asclepias pumila	x	x					x			
Asclepias viridiflora				x	x					
Aster ericoides					x	x				
Aster falcatus				x	x		x	x		
Astragalus adsurgens							x			
Camelina microcarpa		x					x	x		
Carduus nutans		x	x	x	x	x	x	x	x	x
Centaurea diffusa	x	x	x		x		x			
Centaurea repens			x	x	x	x	x	x		
Chenopodium leptophyllum								x	x	
Chrysopsis villosa	x		x		x	x	x	x		
Cirsium arvense	x	x	x			x			x	x
Cirsium undulatum							x			
Collomia linearis				x	x	x	x			
Comandra umbellata			x							
Convolvulus arvensis							x			
Conyza canadensis		x							x	x
Croton texensis	x	x					x	x	x	x
Dalea purpurea							x	x		
Delphinium virescens	x						x			
Descrurania pinnata	x								x	x
Descrurania sophia		x			x				x	x
Dyssodia papposa	x	x		x		x	x	x	x	
Erigeron divergens	x	x		x	x		x	x		
Erigeron flagellaris	x		x	x						
Erodium cicutarium		x							x	x
Erysimum asperum								x		
Euphorbia robusta		x	x	x	x				x	
Euphorbia serpyllifolia	x	x	x	x	x	x	x	x	x	x
Evolvulus nuttallianus									x	
Grindelia squarrosa	x		x	x			x			x
Gutierrezia sarothrae	x		x	x		x				x
Hedeoma hispidum									x	
Helianthus annuus	x	x		x		x	x		x	x
Hypericum perforatum	x	x			x		x		x	
Kochia scoparia									x	
Lactuca serriola	x	x	x	x	x	x	x	x		x
Lepidium campestre									x	
Leucocrinum montanum							x			

[illegible]

HABITAT TYPE: Reclaimed, Affected, 1991 Final (BLTRA91F)

HABITAT TYPE: Reclaimed, Affected, 1991 Final (BLTRA91F)

[illegible]

[illegible]

[illegible]

HABITAT TYPE: Disturbance, Affected, 1991 Final (BLTDA91F)

[illegible]

[illegible]

[illegible]

HABITAT TYPE: Disturbance, Affected, 1991 Final (BLTDA91F)

[illegible]

[illegible]

[illegible]

HABITAT TYPE: Tall Shrub (230) (BLT230DM)

HABITAT TYPE: Tall Shrub (230) (BLT230DM)

[illegible]

[illegible]

FORBS										
Achillea millefolium	x	x	x	x						
Alyssum minus		x								
Ambrosia psilostachya		x								
Arctium minus			x							
Barbarea orthoceras					x					
Carduus nutans		x	x	x						
Centaurea diffusa		x		x						
Centaurea repens		x								
Chenopodium album		x								
Chenopodium fremontii		x								
Cirsium arvense		x	x	x	x					
Conium maculatum					x					
Delphinium virescens				x	x					
Equisetum hymale	x		x							
Equisetum laevigatum				x						
Galium triflorum	x		x	x	x					
Geranium caespitosum	x	x	x		x					
Glycyrrhiza lepidota			x							
Hypericum perforatum		x								
Lactuca serriola		x								
Mertensia lanceolata				x	x					
Monarda fistulosa	x	x	x	x						
Nepeta cataria				x	x					
Onosmodium molle				x						
Osmorhiza depauperata	x			x	x					
Plantago lanceolata				x						
Rorippa sinuata		x								
Rumex obtusifolius				x	x					
Smilacina racemosa	x	x	x	x	x					
Solidago missouriensis	x		x							
Taraxacum officinale			x							
Toxicodendron rydbergii	x		x	x						
Tragopogon dubius		x								
Trifolium dubium		x								
Urtica dioica				x						
Verhascum thapsus		x								
Viola nuttallii	x	x	x	x	x					
OTHER SPECIES PRESENT										
Asparagus officinale			x							
Total Species Present	22	32	26	26	16					

HABITAT TYPE: Riparian Woodland, Reference, 1991 Final (BLTWR91F)

Study Site	BW01R	BW01R	MW01R	MW01R	MW02R	MW02R	MW03R	MW03R	MW04R	MW04R
	1	2	1	2	1	2	1	2	1	2
Transect										
Date(s)	02-Jul	02-Jul	03-Jul	03-Jul	03-Jul	03-Jul	02-Jul	02-Jul	02-Jul	02-Jul
	04-Sep	04-Sep	04-Sep	04-Sep	04-Sep	04-Sep	05-Sep	05-Sep	04-Sep	04-Sep
TREES AND SHRUBS										
<i>Amorpha fruticosa</i>	20	66	160	34	163	33	125	125	123	170
<i>Crataegus erythropoda</i>			12	4						
<i>Humulus lupulus</i>			8							
<i>Populus deltoides</i>	14	9	3		14	3	5	1	9	1
<i>Prunus virginiana</i>				23	1			17		
<i>Rhus aromatica</i>			14		5					
<i>Rosa acicularis</i>	196			7	4	2	15	19		4
<i>Salix amygdaloides</i>					1		4	3		
<i>Salix exigua</i>		108	61	202	7	8	27	150	62	34
<i>Salix ligulifolia</i>		1						2		
<i>Symphoricarpos occidentalis</i>	15			258		6		8		
<i>Ulmus pumila</i>										2
Total Tree and Shrub Density	245	184	258	528	195	52	176	325	194	211
CACTI										
<i>Opuntia fragilis</i>	3		3			16	1			
<i>Opuntia polyacantha</i>	15	3	7	51		5	8	11	13	1
<i>Pediocactus simpsonii</i>	3									
Total Cacti Density	21	3	10	51	0	21	9	11	13	

Study Site	BW01R	BW01R	MW01R	MW01R	MW02R	MW02R	MW03R	MW03R	MW04R	MW04R
	1	2	1	2	1	2	1	2	1	2
Transect										
Date(s)	02-Jul	02-Jul	03-Jul	03-Jul	03-Jul	03-Jul	02-Jul	02-Jul	02-Jul	02-Jul
	04-Sep	04-Sep	04-Sep	04-Sep	04-Sep	04-Sep	05-Sep	05-Sep	04-Sep	04-Sep
TREES AND SHRUBS										
<i>Amorpha fruticosa</i>	20	66	160	34	163	33	125	125	123	170
<i>Crataegus erythropoda</i>			12	4						
<i>Humulus lupulus</i>			8							
<i>Populus deltoides</i>	14	9	3		14	3	5	1	9	1
<i>Prunus virginiana</i>				23	1			17		
<i>Rhus aromatica</i>			14		5					
<i>Rosa acicularis</i>	196			7	4	2	15	19		4
<i>Salix amygdaloides</i>					1		4	3		
<i>Salix exigua</i>		108	61	202	7	8	27	150	62	34
<i>Salix ligulifolia</i>		1						2		
<i>Symphoricarpos occidentalis</i>	15			258		6		8		
<i>Ulmus pumila</i>										2
Total Tree and Shrub Density	245	184	258	528	195	52	176	325	194	211
CACTI										
<i>Opuntia fragilis</i>	3		3			16	1			
<i>Opuntia polyacantha</i>	15	3	7	51		5	8	11	13	1
<i>Pediocactus simpsonii</i>	3									
Total Cacti Density	21	3	10	51	0	21	9	11	13	

GRAMINOIDS										
<i>Agropyron repens</i>	x	x	x	x	x	x			x	x
<i>Agropyron smithii</i>	x	x	x	x	x	x	x	x	x	
<i>Agrostis hyemalis</i>					x					
<i>Agrostis stolonifera</i>		x			x		x	x		
<i>Aristida p. robusta</i>	x	x	x	x					x	x
<i>Bouteloua gracilis</i>	x		x	x		x			x	
<i>Bromus inermis</i>	x						x	x		
<i>Bromus japonicus</i>	x	x	x	x	x	x	x	x	x	x
<i>Bromus porteri</i>		x			x	x	x	x	x	x
<i>Bromus tectorum</i>	x	x	x	x	x	x	x	x	x	x
<i>Buchloe dactyloides</i>	x			x					x	
<i>Carex nebraskensis</i>				x	x	x	x	x		
<i>Carex simulata</i>			x							
<i>Carex eleocharis</i>			x	x				x		
<i>Dactylis glomerata</i>							x	x		
<i>Echinochloa crusgallii</i>										x
<i>Eleocharis coloradoensis</i>		x					x	x		
<i>Eleocharis macrostachya</i>					x	x	x	x		
<i>Elymus canadensis</i>			x	x	x					x
<i>Glyceria grandis</i>								x		
<i>Juncus balticus</i>			x	x	x	x	x	x		
<i>Juncus dudleyi</i>					x	x	x		x	
<i>Juncus nodosus</i>		x								
<i>Juncus torreyi</i>					x	x				
<i>Muhlenbergia racemosa</i>	x	x			x	x			x	x
<i>Phleum pratense</i>			x	x	x	x		x		
<i>Poa compressa</i>	x	x	x	x	x	x	x	x	x	x
<i>Poa pratensis</i>	x		x	x	x	x	x	x	x	x
<i>Scirpus americanus</i>					x					
<i>Scirpus pallidus</i>			x		x	x	x	x	x	x
<i>Sitanion hystrix</i>	x	x		x			x		x	x
<i>Sporobolus cryptandrus</i>	x			x	x				x	
<i>Stipa comata</i>	x	x		x			x		x	
<i>Stipa viridula</i>	x		x	x		x		x		
FORBS										
<i>Achillea millefolium</i>	x	x	x	x	x	x	x	x	x	x
<i>Agrimonia striata</i>				x						
<i>Alisma subcordata</i>							x	x	x	
<i>Alyssum alyssoides</i>			x	x					x	
<i>Alyssum minus</i>	x		x	x	x	x		x	x	x
<i>Ambrosia psilostachya</i>	x	x	x	x	x	x	x	x	x	x
<i>Ambrosia trifida</i>					x					
<i>Apocynum cannabinum</i>							x			
<i>Arabis fendleri</i>	x	x	x	x					x	
<i>Arnica fulgens</i>					x					

<i>Artemisia dracunculus</i>			x							
<i>Artemisia frigida</i>		x	x	x			x	x	x	x
<i>Artemisia ludoviciana</i>	x	x	x	x	x	x	x	x	x	x
<i>Asclepias incarnata</i>		x			x					
<i>Asclepias speciosa</i>	x		x		x	x			x	
<i>Asclepias viridiflora</i>						x				
<i>Aster ericoides</i>								x		
<i>Aster falcatus</i>		x	x	x	x	x			x	x
<i>Aster porteri</i>				x	x			x		x
<i>Astragalus flexuosus</i>	x									
<i>Barbarea orthoceras</i>			x	x	x	x		x		x
<i>Bidens cernua</i>		x	x		x	x				
<i>Camelina microcarpa</i>								x		
<i>Carduus nutans</i>	x		x	x		x	x	x		
<i>Centaurea diffusa</i>		x	x	x	x	x			x	x
<i>Centaurea repens</i>			x	x	x	x	x		x	x
<i>Chenopodium album</i>						x				
<i>Chenopodium leptophyllum</i>						x				
<i>Chrysopsis villosa</i>	x	x	x	x		x	x		x	x
<i>Cicuta douglasii</i>								x		
<i>Cirsium arvense</i>			x	x	x	x	x	x		
<i>Cirsium undulatum</i>							x	x		
<i>Collomia linearis</i>				x						
<i>Convolvulus arvensis</i>									x	x
<i>Conyza canadensis</i>			x	x	x	x				x
<i>Croton texensis</i>	x									
<i>Dalea candida</i>				x						
<i>Descurainia sophia</i>				x						
<i>Epilobium adenocaulon</i>				x	x	x	x	x		x
<i>Equisetum laevigatum</i>			x				x			
<i>Erigeron flagellaris</i>	x	x							x	
<i>Erigeron pumilus</i>			x							
<i>Erodium cicutarium</i>	x									
<i>Euphorbia serpyllifolia</i>									x	x
<i>Galium aparine</i>			x	x	x	x	x	x		x
<i>Galium boreale</i>						x	x		x	
<i>Geranium caespitosum</i>	x	x	x	x	x	x	x	x	x	x
<i>Glycyrrhiza lepidota</i>							x	x		x
<i>Grindelia squarrosa</i>	x	x	x	x		x	x	x		x
<i>Gutierrezia sarothrae</i>	x								x	
<i>Helianthus nuttallii</i>					x	x				
<i>Heracleum sphondylium</i>				x	x					
<i>Hypericum perforatum</i>						x			x	
<i>Kuhnia eupatorioides</i>		x	x						x	
<i>Lactuca scariola</i>	x	x		x	x	x	x	x	x	x
<i>Lathyrus latifolius</i>							x	x		
<i>Liatis punctata</i>			x	x						x
<i>Lomatium orientale</i>			x	x		x				
<i>Lupinus argenteus</i>								x		
<i>Lycopus americanum</i>					x					
<i>Medicago lupulina</i>	x						x		x	x
<i>Melilotus alba</i>		x							x	

Melilotus officinalis									x	
Mentha arvensis		x	x	x	x	x	x	x	x	
Mirabilis hirsuta	x	x							x	
Mirabilis linearis	x	x								
Mirabilis nyctaginea	x	x	x				x		x	x
Monarda fistulosa			x	x	x	x		x		
Musineon divaricatum						x		x		
Nepeta cataria				x	x	x				x
Oenothera flava		x		x		x		x	x	
Onosmodium molle		x	x		x			x		
Oxalis dillenii	x		x		x				x	x
Penstemon secundiflorus	x						x	x	x	
Phacelia heterophylla									x	x
Physalis heterophylla		x					x			
Plantago lanceolata				x				x	x	
Plantago major						x				
Polygonum convolvulus				x		x				
Polygonum lapathifolium					x					
Polygonum (weed)						x				
Prunella vulgaris			x	x	x	x	x	x	x	
Psoralea tenuiflora				x	x					
Ranunculus macounii			x		x			x		
Ratibida columnifera				x						
Ratibida sp.							x			
Rumex mexicanus					x	x	x	x		x
Sagittaria cuneata								x		
Sagittaria latifolia					x					
Scrophularia lanceolata				x						
Selaginella densa	x	x								
Senecio spartioides	x	x	x	x						
Sisymbrium altissimum				x	x	x				
Solidago missouriensis			x	x	x	x	x	x	x	x
Solidago mollis	x	x	x	x		x		x	x	x
Sphaeralcea coccinea					x					
Taraxacum officinale			x					x		
Thermopsis divaricarpa	x	x	x	x	x	x	x	x	x	x
Thlaspi arvense						x				
Tradescantia occidentalis										x
Tragopogon dubius	x	x	x	x			x	x	x	
Verbascum blattaria			x			x		x		x
Verbascum thapsus		x	x	x		x	x		x	x
Verbena hastata					x	x				
Veronica americana					x	x		x		
Veronica a.-aquatica						x	x	x		
Viola canadensis							x			
Viola nephrophylla			x	x	x	x	x		x	
Xanthium strumarium					x	x				
(Basal Leaves) Lomatium?		x		x		x			x	
Total Plant Species Present	49	48	65	72	69	73	59	68	61	51

HABITAT TYPE: Riparian Woodland Affected, 1991 Final (BLTWA91F)

[illegible]

Total Cacti Density	1	8	21	0	0	0	6	0	0	0
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[illegible]

[illegible]

[illegible]

HABITAT TYPE: Riparian Woodland Affected, 1991 Final (BLTWA91F)

[illegible]

[illegible]

FORBS										
Achillea millefolium		x			x					
Agoseris glauca			x							
Alyssum minus		x	x	x	x					
Ambrosia psilostachya		x	x	x	x					
Ambrosia trifida			x	x	x					
Apocynum cannabinum				x						
Artemisia campestris				x						
Artemisia ludoviciana		x	x	x	x					
Asclepias incarnata			x	x						
Asclepias speciosa		x	x	x	x					
Aster ericoides			x	x	x					
Aster falcatus		x		x	x					
Aster laevis		x	x	x	x					
Barbarea orthoceras					x					
Bidens cernua			x	x	x					
Calste gia sepium			x	x						
Capsella bursa-pastoris					x					
Carduus nutans		x	x	x	x					
Centaurea repens		x	x		x					
Chrysopsis villosa					x					
Cicuta douglasii			x							
Cirsium arvense	x	x	x	x						
Conringia orientalis			x							
Convolvulus arvensis		x	x	x	x					
Conyza canadensis		x	x		x					
Epilobium ciliatum			x	x	x					
Equisetum laevigatum	x	x								
Erysimum asperum			x		x					
Galium aparine			x	x	x					
Galium boreale	x	x	x		x					
Geranium caespitosum		x	x	x	x					
Glycyrrhiza lepidota		x								
Grindelia squarrosa		x	x	x	x					
Hypericum perforatum		x	x	x	x					
Lactuca serriola		x	x	x	x					
Lomatium orientale			x	x	x					
Lycopus americanum		x			x					
Melilotus alba		x	x	x						
Melilotus officinalis		x		x	x					
Mentha arvensis		x	x	x						
Mirabilis hirsuta					x					
Mirabilis nyctaginea			x	x						
Monarda fistulosa		x			x					
Nasturtium officinale				x						
Nepeta cataria	x	x	x	x	x					
Oenothera flava		x	x		x					
Oxalis dillenii		x	x	x	x					
Penstemon secundiflorus		x		x						
Phacelia heterophylla	x									
Physalis virginiana		x		x						
Plantago major			x	x						

[illegible]

HABITAT TYPE: Riparian Woodland (110) (BLT110DM)

HABITAT TYPE: Riparian Woodland (110) (BLT110DM)

[illegible]

[illegible]

[illegible]

HABITAT TYPE: Riparian Shrub (210) (BLT210DM)

HABITAT TYPE: Riparian Shrub (210) (BLT210DM)

[illegible]

[illegible]

FORBS										
Achillea millefolium	x									
Ambrosia psilostachya	x		x	x	x					
Artemisia ludoviciana	x									
Asclepias speciosa	x		x							
Astragalus spatulatus	x		x							
Carduus nutans	x									
Chrysopsis villosa	x									
Cichorium intybus	x									
Cirsium arvense	x	x	x	x	x					
Cirsium sp.			x							
Cirsium undulatum		x								
Descrurania pinnata			x	x						
Epilobium horeomanii				x	x					
Equisetum hyemale			x							
Euphorbia marginata	x		x							
Galium sp.	x									
Galium triflorum	x									
Gaura coccinea	x									
Glycyrrhiza lepidota	x		x		x					
Helianthus annuus	x									
Lactuca scariola	x									
Linaria dalmatica					x					
Lycopus americanum		x		x						
Mentha arvensis		x	x		x					
Monarda fistulosa			x							
Nepeta cataria			x							
Oenothera brachycarpa	x									
Oenothera flava					x					
Physalis virginiana	x	x	x							
Plantago lanceolata	x		x							
Plantago patagonica			x	x						
Polygonum sawatchense				x	x					
Psoralea tenuiflora			x							
Ranunculus macounii		x	x							
Rorippa sinuata				x	x					
Rumex crispus	x	x	x	x	x					
Solidago missouriensis	x		x							
Taraxacum officinale	x									
Toxicodendron rydbergii				x						
Verbascum blattaria		x								
Verbascum thapsus			x							
Verbena hastata			x	x						
Xanthium strumarium	x		x							
OTHER SPECIES PRESENT										
Xanthium strumarium				x						
Glycyrrhiza lepidota				x						
Total Species Present	29	17	29	20	25					

HABITAT TYPE: Marshland Reference, 1991 Final (BLTAR91F)

[illegible][illegible]

[illegible]

FORBS										
Achillea millefolium			x	x	x	x	x	x	x	
Alisma subcordatum							x			
Alyssum minus								x		
Ambrosia psilostachya	x			x			x	x		
Artemisia ludoviciana	x						x			
Asclepias incarnata			x	x					x	x
Asclepias speciosa	x		x	x						
Asclepias viridiflora	x									x
Aster ericoides				x			x	x		
Aster falcatus	x								x	
Barbarea orthoceras	x	x	x	x	x	x	x	x	x	x
Carduus nutans								x		
Centaurea diffusa							x			
Centaurea repens	x	x	x	x	x	x		x		x
Chenopodium leptophyllum								x		
Cicuta maculata	x	x								
Cirsium arvense	x	x	x	x	x	x	x	x	x	x
Cirsium undulatum								x		
Collomia linearis									x	x
Conium maculatum	x	x								
Convolvulus arvensis		x	x	x				x	x	
Epilobium ciliatum		x			x					
Equisetum arvense	x									
Equisetum laevigatum							x	x		
Evolvulus nuttallianus										x
Galium aparine			x	x	x		x	x	x	
Galium boreale	x	x			x				x	x
Geranium caespitosum	x	x					x			
Glycyrrhiza lepidota	x	x								
Hypericum perforatum		x			x					
Iris missouriensis	x	x								
Lomatium orientale	x									
Lycopus americanum	x	x	x	x	x	x			x	x
Medicago lupulina								x		
Mentha arvensis	x	x	x	x	x	x	x	x	x	x
Monarda fistulosa	x	x			x	x			x	x
Nasturtium officinale	x									
Nepeta cataria	x	x			x	x				x
Oenothera flava		x				x	x	x		
Onosmodium molle		x						x		x
Oxalis dillenii								x		
Polygonum amphibium				x						
Polygonum lapathifolium	x			x	x					
Potentilla gracilis	x				x					
Prunella vulgaris	x	x		x		x		x	x	
Psoralea tenuiflora	x									
Ranunculus macounii	x	x	x	x	x	x	x	x	x	x
Ratibida columnifera								x		
Rorippa palustris				x					x	
Rumex crispus					x		x	x		
Rumex mexicanus	x						x	x		

[illegible]

[illegible]

[illegible]

HABITAT TYPE: Aquatic (Wetland) Affected, 1991 Final (BLTAA91F)

[illegible]

[illegible]

[illegible]

HABITAT TYPE: Short Marsh (020) (BLT020DM)

HABITAT TYPE: Short Marsh (020) (BLT020DM)

[illegible]

[illegible]

[illegible]

HABITAT TYPE: Tall Marsh (030) (BLT030DM)

HABITAT TYPE: Tall Marsh (030) (BLT030DM)

[illegible]

[illegible]

[illegible]

HABITAT TYPE: Xeric Mixed Grassland, Reference, 1991 Final (CVRXR91P)

Study Site	BX01R	BX01R	MX01R	MX01R	MX02R	MX02R	MX03R	MX03R	MX04R	MX04R
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[illegible]

HABITAT TYPE: Disturbance, Affected, 1991 Final (CVRDA91F)

[illegible]

[illegible]

[illegible]

[illegible]

HABITAT TYPE: Disturbance, Affected, 1991 Final (CVRDA91F)

[illegible]

[illegible]

[illegible]

[illegible]

HABITAT TYPE: Tall Shrub (230) (CVR230DM)

HABITAT TYPE: Tall Shrub (230) (CVR230DM)

HABITAT TYPE: Tall Shrub (230) (CVR230DM)								
Study Site	V230	V230	V230	V230	V230			
Transect	2	3	4	8	9			
Date(s)	16-Sep	16-Sep	17-Sep	19-Sep	17-Sep			
TREE CANOPY *								
Acer glabrum	3							
Clematis ligusticifolia			3					
Crataegus erythropoda	65		74	67	75			
Prunus virginiana	28		19	25	20			
Rhus aromatica			8					
* Canopy greater than 3 meters in height, regardless of species.								
Total Trees	96	0	104	92	95			
SHRUB CANOPY								
Acer glabrum	2							
Clematis ligusticifolia				1				
Crataegus erythropoda	1							
Berberis repens				8				
Prunus virginiana	6		4	6	3			
Rhus aromatica	4		3					
Rosa acicularis	14		6					
Symphoricarpos occidentalis	19			4	2			
Symphoricarpos sp.			8					
Total Shrubs	46	0	21	19	5			

[illegible]

[illegible]

[illegible]

HABITAT TYPE: Riparian Woodland Reference, 1991 Final (CVRWR91F)

HABITAT TYPE: Riparian Woodland Reference, 1991 Final (CVRWR91F)

[illegible]

[illegible]

[illegible]

[illegible]

HABITAT TYPE: Riparian Woodland, Affected, 1991 Final (CVRWA91F)

HABITAT TYPE: Riparian Woodland, Affected, 1991 Final (CVRWA91F)

[illegible]

[illegible]

[illegible]

[illegible]

HABITAT TYPE: Riparian Woodland, Affected, 1991 Final (CVRWA91F)

Study Site	MW03A	MW03A	MW04A	MW04A	MW04A
Transect	2	3	1	2	3
Date(s)	03-Sep	16-Sep	03-Sep	03-Sep	18-Sep
TREE CANOPY					
<i>Populus angustifolia</i>	15				
<i>Populus deltoides</i>	5	11		22	11
<i>Salix amygdaloides</i>	25				
Total Tree Canopy	45	11	0	22	11
SHRUB CANOPY					
<i>Amorpha fruticosa</i>	12	4	50	21	30
<i>Populus angustifolia</i>	9				
<i>Salix amygdaloides</i>	3				
<i>Salix exigua</i>	45	28	12	15	
<i>Symphoricarpos occidentalis</i>	2	2	3		
Total Shrub Canopy	71	34	65	36	30

[illegible]

[illegible]

[illegible]

[illegible]

(7) Forbs										
Alyssum minus	1				1					
Ambrosia psilostachya	1	2			1					
Arenaria fendleri			2							
Artemisia dracunculus								1		
Artemisia frigida		2				1	1	2		2
Artemisia ludoviciana		1			1	5				1
Aster porteri		6	5	3	1	3	1	3	1	
Chrysopsis fulcrata				1						
Chrysopsis villosa	1						2	3		
Erigeron flagellaris	2	2			1	4	2		4	
Eriogonum alatum				2				1		
Helianthus pumilus						1				1
Hypericum perforatum	1		1							
Liatris punctata			1			1		1	2	2
Oxytropis lambertii								1		
Paronychia jamesii				1						
Phacelia heterophylla								1		1
Solidago nemoralis				3				1		
Vaccaria pyramidata								1		
Total Plant Ground Cover	30	30	29	35	29	39	31	37	34	33

HABITAT TYPE: Xeric Mixed Grassland, Affected, 1991 Final (CVRXA91F)

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

HABITAT TYPE: Reclaimed, Affected, Final 1991 (CVRRA91F)

HABITAT TYPE: Reclaimed, Affected, Final 1991 (CVRRA91F)

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

HABITAT TYPE: Riparian Woodland (110) (CVR110DM)

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

HABITAT TYPE: Marshland Reference, 1991 Final (CVRAR91F)

Total Shrub Canopy	15	0	0	1	1	0	0	0	6	0
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HABITAT TYPE: Marshland Affected, 1991 Final (CVRAA91F)

HABITAT TYPE: Marshland Affected, 1991 Final (CVRAA91F)

HABITAT TYPE: Marshland Affected, 1991 Final (CVRAA91F)

HABITAT TYPE: Short Marsh (020) (COVR20DM)

COVER TRANSECT SUMMARY FORM

HABITAT TYPE: Tall Marsh (030) (COVR30DM)

Transects: Baseline, OU1

File:RAHSPRB1.WK1

Transects: All

File: RAHSUMB1.WK1

RELATIVE ABUNDANCE SUMMARY, BIRDS

Season/Year: April, 1991

30-Mar-92

Transects: Baseline

File: RABAPRB1.WK1

Species	WETLAND HABITATS (9.6 Hours)		WOODLAND HABITATS (5.8 Hours)		SHRUBLAND HABITATS (7.9 Hours)		GRASSLAND HABITATS (13.0 Hours)		DISTURBED HABITATS (4.0 Hours)		TOTAL (40.3 Hours)	
	Number	No./Hour	Number	No./Hour	Number	No./Hour	Number	No./Hour	Number	No./Hour	Number	No./Hour
Western Meadowlark	23	2.40	9	1.55	59	7.47	127	9.77	20	5.00	238	5.91
Red-winged Blackbird	109	11.35	15	2.59	22	2.78	0	0.00	9	2.25	155	3.85
Mallard	126	13.13	3	0.52	4	0.51	1	0.08	0	0.00	134	3.33
Mourning Dove	21	2.19	56	9.66	16	2.03	22	1.69	8	2.00	123	3.05
Brewer's Blackbird	16	1.67	0	0.00	0	0.00	29	2.23	12	3.00	57	1.41
Song Sparrow	22	2.29	6	1.03	23	2.91	0	0.00	3	0.75	54	1.34
Lesser Scaup	53	5.52	0	0.00	0	0.00	0	0.00	0	0.00	53	1.32
Vesper Sparrow	3	0.31	7	1.21	15	1.90	20	1.54	1	0.25	46	1.14
Ring-billed Gull	0	0.00	0	0.00	0	0.00	45	3.46	0	0.00	45	1.12
Common Raven	3	0.31	0	0.00	1	0.13	33	2.54	5	1.25	42	1.04
European Starling	0	0.00	15	2.59	4	0.51	3	0.23	18	4.50	40	0.99
Killdeer	21	2.19	0	0.00	0	0.00	1	0.08	4	1.00	26	0.65
Black-billed Magpie	0	0.00	0	0.00	22	2.78	3	0.23	0	0.00	25	0.62
White-crowned Sparrow	0	0.00	5	0.86	18	2.28	0	0.00	0	0.00	23	0.57
Barn Swallow	15	1.56	1	0.17	0	0.00	0	0.00	5	1.25	21	0.52
Green-winged Teal	20	2.08	0	0.00	0	0.00	0	0.00	0	0.00	20	0.50
American Robin	0	0.00	5	0.86	9	1.14	0	0.00	0	0.00	14	0.35
Great Horned Owl	0	0.00	11	1.90	2	0.25	1	0.08	0	0.00	14	0.35
Willet	13	1.35	0	0.00	0	0.00	0	0.00	0	0.00	13	0.32
Yellow-rumped Warbler	0	0.00	12	2.07	0	0.00	0	0.00	0	0.00	12	0.30
Rock Dove	11	1.15	0	0.00	0	0.00	1	0.08	0	0.00	12	0.30
Savannah Sparrow	1	0.10	0	0.00	3	0.38	2	0.15	6	1.50	12	0.30
Say's Phoebe	3	0.31	2	0.34	2	0.25	1	0.08	2	0.50	10	0.25
Common Snipe	10	1.04	0	0.00	0	0.00	0	0.00	0	0.00	10	0.25
Blue-winged Teal	10	1.04	0	0.00	0	0.00	0	0.00	0	0.00	10	0.25
Rock Wren	0	0.00	0	0.00	0	0.00	2	0.15	7	1.75	9	0.22
Cinnamon Teal	8	0.83	0	0.00	0	0.00	0	0.00	0	0.00	8	0.20
Chipping Sparrow	3	0.31	2	0.34	3	0.38	0	0.00	0	0.00	8	0.20

Red-tailed Hawk	0	0.00	4	0.69	0	0.00	3	0.23	1	0.25	8	0.20
Loggerhead Shrike	0	0.00	5	0.86	3	0.38	0	0.00	0	0.00	8	0.20
Yellow-headed Blackbird	7	0.73	0	0.00	0	0.00	0	0.00	0	0.00	7	0.17
American Coot	6	0.63	0	0.00	0	0.00	1	0.08	0	0.00	7	0.17
Common Merganser	7	0.73	0	0.00	0	0.00	0	0.00	0	0.00	7	0.17
Rufous-sided Towhee	0	0.00	1	0.17	6	0.76	0	0.00	0	0.00	7	0.17
Ring-necked Duck	6	0.63	0	0.00	0	0.00	0	0.00	0	0.00	6	0.15
American Kestrel	0	0.00	4	0.69	0	0.00	2	0.15	0	0.00	6	0.15
Canada Goose	4	0.42	0	0.00	0	0.00	2	0.15	0	0.00	6	0.15
Horned Lark	0	0.00	0	0.00	0	0.00	4	0.31	1	0.25	5	0.12
Dark-eyed Junco	0	0.00	1	0.17	4	0.51	0	0.00	0	0.00	5	0.12
Northern Flicker	0	0.00	3	0.52	2	0.25	0	0.00	0	0.00	5	0.12
Prairie Falcon	0	0.00	0	0.00	0	0.00	4	0.31	0	0.00	4	0.10
Sharp-shinned Hawk	0	0.00	1	0.17	1	0.13	0	0.00	2	0.50	4	0.10
Pinyon Jay	0	0.00	4	0.69	0	0.00	0	0.00	0	0.00	4	0.10
Lesser Yellowlegs	4	0.42	0	0.00	0	0.00	0	0.00	0	0.00	4	0.10
Great Blue Heron	3	0.31	1	0.17	0	0.00	0	0.00	0	0.00	4	0.10
American Tree Sparrow	0	0.00	0	0.00	3	0.38	0	0.00	0	0.00	3	0.07
Pectoral Sandpiper	3	0.31	0	0.00	0	0.00	0	0.00	0	0.00	3	0.07
Hooded Merganser	3	0.31	0	0.00	0	0.00	0	0.00	0	0.00	3	0.07
Turkey Vulture	1	0.10	0	0.00	1	0.13	1	0.08	0	0.00	3	0.07
Dowitcher	3	0.31	0	0.00	0	0.00	0	0.00	0	0.00	3	0.07
Pied-billed Grebe	2	0.21	0	0.00	0	0.00	0	0.00	0	0.00	2	0.05
House Wren	0	0.00	1	0.17	1	0.13	0	0.00	0	0.00	2	0.05
Green-tailed Towhee	0	0.00	2	0.34	0	0.00	0	0.00	0	0.00	2	0.05
Tree Swallow	1	0.10	0	0.00	0	0.00	1	0.08	0	0.00	2	0.05
Ferruginous Hawk	0	0.00	1	0.17	0	0.00	1	0.08	0	0.00	2	0.05
Short-eared Owl	0	0.00	0	0.00	2	0.25	0	0.00	0	0.00	2	0.05
Blk-crowned Night Heron	2	0.21	0	0.00	0	0.00	0	0.00	0	0.00	2	0.05
Townsend's Solitaire	0	0.00	1	0.17	0	0.00	0	0.00	0	0.00	1	0.02
Northern Harrier	1	0.10	0	0.00	0	0.00	0	0.00	0	0.00	1	0.02
Brown-headed Cowbird	1	0.10	0	0.00	0	0.00	0	0.00	0	0.00	1	0.02
Marsh Wren	1	0.10	0	0.00	0	0.00	0	0.00	0	0.00	1	0.02
Bufflehead	1	0.10	0	0.00	0	0.00	0	0.00	0	0.00	1	0.02
Ring-necked Pheasant	1	0.10	0	0.00	0	0.00	0	0.00	0	0.00	1	0.02

RELATIVE ABUNDANCE SUMMARY, BIRDS

Season/Year: May, 1991

Transects: Baseline

09-Apr-92

File:RABMAYB1.WK1

	WETLAND HABITATS (6.3 Hours)		WOODLAND HABITATS (5.8 Hours)		SHRUBLAND HABITATS (4.9 Hours)		GRASSLAND HABITATS (6.7 Hours)		DISTURBED HABITATS (2.2 Hours)		TOTAL (26.9 Hours)	
Species	Number	No./Hour	Number	No./Hour	Number	No./Hour	Number	No./Hour	Number	No./Hour	Number	No./Hour
Red-winged Blackbird	160	25.40	22	3.79	17	3.47	29	4.33	11	5.00	239	8.88
Western Meadowlark	5	0.79	6	1.03	1	0.20	76	11.34	5	2.27	93	3.46
Mourning Dove	8	1.27	36	6.21	3	0.61	13	1.94	31	14.09	91	3.38
Vesper Sparrow	2	0.32	9	1.55	7	1.43	47	7.01	18	8.18	83	3.09
Mallard	40	6.35	0	0.00	0	0.00	9	1.34	0	0.00	49	1.82
Barn Swallow	17	2.70	7	1.21	3	0.61	11	1.64	6	2.73	44	1.64
Tree Swallow	34	5.40	0	0.00	8	1.63	1	0.15	0	0.00	43	1.60
Northern Oriole	1	0.16	25	4.31	11	2.24	2	0.30	0	0.00	39	1.45
American Tree Sparrow	3	0.48	13	2.24	20	4.08	1	0.15	1	0.45	38	1.41
Cliff Swallow	27	4.29	0	0.00	1	0.20	0	0.00	0	0.00	28	1.04
Killdeer	20	3.17	0	0.00	0	0.00	3	0.45	5	2.27	28	1.04
European Starling	1	0.16	15	2.59	2	0.41	4	0.60	3	1.36	25	0.93
House Finch	0	0.00	18	3.10	0	0.00	1	0.15	6	2.73	25	0.93
Violet-green Swallow	17	2.70	6	1.03	0	0.00	0	0.00	0	0.00	23	0.86
American Goldfinch	0	0.00	15	2.59	7	1.43	0	0.00	0	0.00	22	0.82
Rufous-sided Towhee	0	0.00	3	0.52	14	2.86	0	0.00	0	0.00	17	0.63
Black-billed Magpie	0	0.00	1	0.17	15	3.06	0	0.00	0	0.00	16	0.59
American Robin	1	0.16	9	1.55	2	0.41	3	0.45	0	0.00	15	0.56
Brewer's Blackbird	0	0.00	3	0.52	0	0.00	10	1.49	2	0.91	15	0.56
Say's Phoebe	0	0.00	2	0.34	0	0.00	8	1.19	3	1.36	13	0.48
Chipping Sparrow	1	0.16	0	0.00	4	0.82	6	0.90	0	0.00	11	0.41
Great Blue Heron	4	0.63	1	0.17	1	0.20	4	0.60	0	0.00	10	0.37
Common Raven	0	0.00	0	0.00	0	0.00	9	1.34	1	0.45	10	0.37
Spotted Sandpiper	9	1.43	0	0.00	0	0.00	0	0.00	0	0.00	9	0.33
Great Horned Owl	0	0.00	7	1.21	2	0.41	0	0.00	0	0.00	9	0.33
Blue-wing Teal	8	1.27	0	0.00	0	0.00	0	0.00	0	0.00	8	0.30
White-crowned Sparrow	0	0.00	7	1.21	1	0.20	0	0.00	0	0.00	8	0.30
Canada Goose	8	1.27	0	0.00	0	0.00	0	0.00	0	0.00	8	0.30

Yellow-rumped Warbler	0	0.00	7	1.21	0	0.00	0	0.00	0	0.00	7	0.26
Blk-crowned Night Heron	0	0.00	2	0.34	0	0.00	0	0.00	5	2.27	7	0.26
Yellow Warbler	0	0.00	6	1.03	0	0.00	0	0.00	0	0.00	6	0.22
Common Grackle	0	0.00	1	0.17	0	0.00	1	0.15	4	1.82	6	0.22
Savannah Sparrow	0	0.00	0	0.00	0	0.00	4	0.60	1	0.45	5	0.19
Eastern Kingbird	0	0.00	1	0.17	1	0.20	2	0.30	0	0.00	4	0.15
Western Kingbird	2	0.32	1	0.17	0	0.00	1	0.15	0	0.00	4	0.15
Yellow-headed Blackbird	4	0.63	0	0.00	0	0.00	0	0.00	0	0.00	4	0.15
Common Snipe	3	0.48	0	0.00	0	0.00	0	0.00	0	0.00	3	0.11
Lesser Goldfinch	0	0.00	3	0.52	0	0.00	0	0.00	0	0.00	3	0.11
Lincoln's Sparrow	2	0.32	1	0.17	0	0.00	0	0.00	0	0.00	3	0.11
Common Yellowthroat	3	0.48	0	0.00	0	0.00	0	0.00	0	0.00	3	0.11
Yellow-breasted Chat	0	0.00	2	0.34	1	0.20	0	0.00	0	0.00	3	0.11
Ferruginous Hawk	0	0.00	1	0.17	0	0.00	1	0.15	0	0.00	2	0.07
American Coot	0	0.00	2	0.34	0	0.00	0	0.00	0	0.00	2	0.07
Marsh Wren	1	0.16	0	0.00	0	0.00	0	0.00	1	0.45	2	0.07
Rock Wren	0	0.00	0	0.00	0	0.00	0	0.00	2	0.91	2	0.07
Red-tailed Hawk	0	0.00	0	0.00	1	0.20	1	0.15	0	0.00	2	0.07
Western Flycatcher	0	0.00	1	0.17	1	0.20	0	0.00	0	0.00	2	0.07
Blue Grosbeak	0	0.00	2	0.34	0	0.00	0	0.00	0	0.00	2	0.07
Cinnamon Teal	2	0.32	0	0.00	0	0.00	0	0.00	0	0.00	2	0.07
Brown-headed Cowbird	0	0.00	0	0.00	2	0.41	0	0.00	0	0.00	2	0.07
Red-tailed Hawk	0	0.00	2	0.34	0	0.00	0	0.00	0	0.00	2	0.07
Western Wood-Pewee	0	0.00	0	0.00	1	0.20	0	0.00	0	0.00	1	0.04
Grasshopper Sparrow	0	0.00	0	0.00	0	0.00	1	0.15	0	0.00	1	0.04
Western Tanager	0	0.00	1	0.17	0	0.00	0	0.00	0	0.00	1	0.04
Black-capped Chickadee	0	0.00	1	0.17	0	0.00	0	0.00	0	0.00	1	0.04
Cassin's Finch	0	0.00	0	0.00	1	0.20	0	0.00	0	0.00	1	0.04
American Kestrel	1	0.16	0	0.00	0	0.00	0	0.00	0	0.00	1	0.04
Green-tailed Towhee	0	0.00	0	0.00	1	0.20	0	0.00	0	0.00	1	0.04
Warbling Vireo	0	0.00	1	0.17	0	0.00	0	0.00	0	0.00	1	0.04
House Wren	0	0.00	1	0.17	0	0.00	0	0.00	0	0.00	1	0.04
Dusky Flycatcher	0	0.00	1	0.17	0	0.00	0	0.00	0	0.00	1	0.04
Swainson's Hawk	0	0.00	0	0.00	0	0.00	1	0.15	0	0.00	1	0.04
Lazuli Bunting	0	0.00	1	0.17	0	0.00	0	0.00	0	0.00	1	0.04

RELATIVE ABUNDANCE SUMMARY, BIRDS

Season/Year: June, 1991

Transects: Baseline, OU1

30-Mar-92

File: RABJUNB1.WK1

	WETLAND HABITATS (4.5 Hours)		WOODLAND HABITATS (4.1 Hours)		SHRUBLAND HABITATS (2.3 Hours)		GRASSLAND HABITATS (7.2 Hours)		DISTURBED HABITATS (1.4 Hours)		TOTAL (19.5 Hours)	
Species	Number	No./Hour	Number	No./Hour	Number	No./Hour	Number	No./Hour	Number	No./Hour	Number	No./Hour
Red-winged Blackbird	198	44.00	16	3.90	29	12.61	45	6.25	6	4.29	294	15.08
Western Meadowlark	5	1.11	23	5.61	8	3.48	120	16.67	3	2.14	159	8.15
Mourning Dove	14	3.11	61	14.88	6	2.61	7	0.97	4	2.86	92	4.72
Vesper Sparrow	11	2.44	11	2.68	9	3.91	57	7.92	0	0.00	88	4.51
House Finch	4	0.89	58	14.15	0	0.00	2	0.28	13	9.29	77	3.95
Mallard	52	11.56	0	0.00	0	0.00	0	0.00	0	0.00	52	2.67
European Starling	0	0.00	33	8.05	0	0.00	11	1.53	5	3.57	49	2.51
Killdeer	24	5.33	0	0.00	0	0.00	2	0.28	5	3.57	31	1.59
Barn Swallow	14	3.11	0	0.00	1	0.43	14	1.94	1	0.71	30	1.54
Song Sparrow	2	0.44	6	1.46	7	3.04	13	1.81	0	0.00	28	1.44
Black-billed Magpie	0	0.00	4	0.98	11	4.78	2	0.28	1	0.71	18	0.92
Northern Oriole	0	0.00	16	3.90	2	0.87	0	0.00	0	0.00	18	0.92
Cliff Swallow	1	0.22	0	0.00	1	0.43	15	2.08	0	0.00	17	0.87
American Goldfinch	2	0.44	6	1.46	5	2.17	3	0.42	1	0.71	17	0.87
Common Grackle	7	1.56	7	1.71	2	0.87	0	0.00	0	0.00	16	0.82
Brewer's Blackbird	4	0.89	8	1.95	0	0.00	0	0.00	4	2.86	16	0.82
Grasshopper Sparrow	0	0.00	0	0.00	0	0.00	15	2.08	0	0.00	15	0.77
Western Kingbird	0	0.00	2	0.49	0	0.00	6	0.83	2	1.43	10	0.51
Great Horned Owl	0	0.00	4	0.98	2	0.87	1	0.14	2	1.43	9	0.46
Yellow Warbler	0	0.00	9	2.20	0	0.00	0	0.00	0	0.00	9	0.46
Red-tailed Hawk	0	0.00	3	0.73	0	0.00	5	0.69	0	0.00	8	0.41
Rufous-sided Towhee	0	0.00	1	0.24	6	2.61	0	0.00	0	0.00	7	0.36
Yellow-headed Blackbird	6	1.33	1	0.24	0	0.00	0	0.00	0	0.00	7	0.36
Blue Grosbeak	0	0.00	1	0.24	4	1.74	2	0.28	0	0.00	7	0.36
Ring-billed Gull	0	0.00	0	0.00	1	0.43	6	0.83	0	0.00	7	0.36
Spotted Sandpiper	6	1.33	0	0.00	0	0.00	0	0.00	0	0.00	6	0.31
Blk-crowned Night Heron	5	1.11	0	0.00	1	0.43	0	0.00	0	0.00	6	0.31
Blue-winged Teal	5	1.11	0	0.00	0	0.00	0	0.00	0	0.00	5	0.26

Canada Goose	5	1.11	0	0.00	0	0.00	0	0.00	0	0.00	5	0.26
Common Yellowthroat	2	0.44	0	0.00	2	0.87	0	0.00	0	0.00	4	0.21
Great Blue Heron	4	0.89	0	0.00	0	0.00	0	0.00	0	0.00	4	0.21
Tree Swallow	0	0.00	1	0.24	0	0.00	3	0.42	0	0.00	4	0.21
Eastern Kingbird	0	0.00	4	0.98	0	0.00	0	0.00	0	0.00	4	0.21
Brown-headed Cowbird	1	0.22	0	0.00	1	0.43	1	0.14	0	0.00	3	0.15
Rock Wren	0	0.00	0	0.00	0	0.00	0	0.00	3	2.14	3	0.15
Common Raven	0	0.00	0	0.00	0	0.00	1	0.14	2	1.43	3	0.15
Violet-green Swallow	1	0.22	0	0.00	0	0.00	2	0.28	0	0.00	3	0.15
Lesser Goldfinch	0	0.00	3	0.73	0	0.00	0	0.00	0	0.00	3	0.15
Common Nighthawk	0	0.00	0	0.00	0	0.00	1	0.14	2	1.43	3	0.15
American Robin	0	0.00	2	0.49	0	0.00	0	0.00	0	0.00	2	0.10
Horned Lark	0	0.00	1	0.24	0	0.00	1	0.14	0	0.00	2	0.10
Green-tailed Towhee	0	0.00	0	0.00	2	0.87	0	0.00	0	0.00	2	0.10
Say's Phoebe	0	0.00	0	0.00	1	0.43	0	0.00	1	0.71	2	0.10
Cooper's Hawk	0	0.00	0	0.00	0	0.00	1	0.14	0	0.00	1	0.05
Cinnamon Teal	1	0.22	0	0.00	0	0.00	0	0.00	0	0.00	1	0.05
Pintail	1	0.22	0	0.00	0	0.00	0	0.00	0	0.00	1	0.05
Western Wood-Pewee	0	0.00	1	0.24	0	0.00	0	0.00	0	0.00	1	0.05
Turkey Vulture	0	0.00	0	0.00	0	0.00	1	0.14	0	0.00	1	0.05
Ferruginous Hawk	1	0.22	0	0.00	0	0.00	0	0.00	0	0.00	1	0.05
Broadtailed Hummingbird	0	0.00	0	0.00	0	0.00	1	0.14	0	0.00	1	0.05
Chipping Sparrow	0	0.00	1	0.24	0	0.00	0	0.00	0	0.00	1	0.05
Savannah Sparrow	1	0.22	0	0.00	0	0.00	0	0.00	0	0.00	1	0.05
Warbling Vireo	0	0.00	1	0.24	0	0.00	0	0.00	0	0.00	1	0.05
American Coot	1	0.22	0	0.00	0	0.00	0	0.00	0	0.00	1	0.05
Total Species/Habitat	378	84.00	284	69.27	101	43.91	338	46.94	55	39.29	1156	59.28

RELATIVE ABUNDANCE SUMMARY, BIRDS

Season/Year: July, 1991

Transects: Baseline, OU1

30-Mar-92

File: RABJULB1.WK1

	WETLAND HABITATS (4.5 Hours)		WOODLAND HABITATS (4.8 Hours)		SHRUBLAND HABITATS (3.0 Hours)		GRASSLAND HABITATS (3.8 Hours)		DISTURBED HABITATS (1.5 Hours)		TOTAL (17.6 Hours)	
Species	Number	No./Hour	Number	No./Hour	Number	No./Hour	Number	No./Hour	Number	No./Hour	Number	No./Hour
Red-winged Blackbird	183	40.67	18	3.75	28	9.33	10	2.63	1	0.67	240	13.64
House Finch	0	0.00	54	11.25	36	12.00	84	22.11	0	0.00	174	9.89
Vesper Sparrow	4	0.89	44	9.17	46	15.33	38	10.00	6	4.00	138	7.84
Western Meadowlark	19	4.22	35	7.29	18	6.00	30	7.89	4	2.67	106	6.02
Mourning Dove	23	5.11	40	8.33	2	0.67	8	2.11	9	6.00	82	4.66
Barn Swallow	19	4.22	39	8.13	2	0.67	9	2.37	0	0.00	69	3.92
Northern Oriole	0	0.00	27	5.63	9	3.00	0	0.00	0	0.00	36	2.05
Mallard	23	5.11	0	0.00	0	0.00	1	0.26	0	0.00	24	1.36
American Goldfinch	5	1.11	14	2.92	2	0.67	2	0.53	1	0.67	24	1.36
Western Kingbird	0	0.00	21	4.38	0	0.00	1	0.26	0	0.00	22	1.25
Song Sparrow	3	0.67	7	1.46	11	3.67	0	0.00	0	0.00	21	1.19
Black-billed Magpie	0	0.00	1	0.21	14	4.67	0	0.00	3	2.00	18	1.02
Cliff Swallow	1	0.22	12	2.50	3	1.00	2	0.53	0	0.00	18	1.02
Killdeer	15	3.33	0	0.00	0	0.00	0	0.00	2	1.33	17	0.97
Say's Phoebe	4	0.89	5	1.04	2	0.67	2	0.53	0	0.00	13	0.74
European Starling	0	0.00	12	2.50	0	0.00	1	0.26	0	0.00	13	0.74
Rufous-sided Towhee	0	0.00	0	0.00	9	3.00	0	0.00	0	0.00	9	0.51
Tree Swallow	2	0.44	0	0.00	2	0.67	5	1.32	0	0.00	9	0.51
Brown-headed Cowbird	4	0.89	2	0.42	2	0.67	0	0.00	0	0.00	8	0.45
Common Yellowthroat	6	1.33	1	0.21	0	0.00	0	0.00	0	0.00	7	0.40
Blue Grosbeak	0	0.00	6	1.25	0	0.00	0	0.00	0	0.00	6	0.34
Canada Goose	6	1.33	0	0.00	0	0.00	0	0.00	0	0.00	6	0.34
Rock Wren	0	0.00	0	0.00	0	0.00	0	0.00	5	3.33	5	0.28
Brewer's Blackbird	0	0.00	5	1.04	0	0.00	0	0.00	0	0.00	5	0.28
Red-tailed Hawk	0	0.00	3	0.63	0	0.00	1	0.26	1	0.67	5	0.28
Common Raven	0	0.00	1	0.21	0	0.00	4	1.05	0	0.00	5	0.28
Common Nighthawk	1	0.22	1	0.21	0	0.00	0	0.00	2	1.33	4	0.23
Blk-crowned Night Heron	3	0.67	0	0.00	0	0.00	0	0.00	0	0.00	3	0.17

RELATIVE ABUNDANCE SUMMARY, BIRDS

Season/Year: August, 1991

Transects: Baseline, OUI

30-Mar-92

File: RABAUGB1.wk1

Species	WETLAND HABITATS (3.3 Hours)		WOODLAND HABITATS (3.3 Hours)		SHRUBLAND HABITATS (2.7 Hours)		GRASSLAND HABITATS (6.5 Hours)		DISTURBED HABITATS (1.4 Hours)		TOTAL (17.2 Hours)	
	Number	No./Hour	Number	No./Hour	Number	No./Hour	Number	No./Hour	Number	No./Hour	Number	No./Hour
House Finch	0	0.00	110	33.33	63	23.33	141	21.69	4	2.86	318	18.49
Pine Siskin	0	0.00	70	21.21	20	7.41	33	5.08	0	0.00	123	7.15
Mourning Dove	36	10.91	24	7.27	2	0.74	34	5.23	10	7.14	106	6.16
Vesper Sparrow	12	3.64	12	3.64	14	5.19	42	6.46	6	4.29	86	5.00
Red-winged Blackbird	46	13.94	4	1.21	1	0.37	20	3.08	0	0.00	71	4.13
American Goldfinch	0	0.00	23	6.97	19	7.04	22	3.38	0	0.00	64	3.72
Western Meadowlark	2	0.61	3	0.91	5	1.85	44	6.77	3	2.14	57	3.31
Tree Swallow	7	2.12	15	4.55	6	2.22	26	4.00	0	0.00	54	3.14
Barn Swallow	10	3.03	5	1.52	4	1.48	29	4.46	4	2.86	52	3.02
Mallard	23	6.97	0	0.00	0	0.00	0	0.00	0	0.00	23	1.34
American Robin	0	0.00	11	3.33	10	3.70	1	0.15	0	0.00	22	1.28
Say's Phoebe	2	0.61	2	0.61	3	1.11	12	1.85	3	2.14	22	1.28
Western Kingbird	0	0.00	3	0.91	0	0.00	11	7.86	0	0.00	14	0.81
Yellow Warbler	0	0.00	11	3.33	1	0.37	1	0.15	0	0.00	13	0.76
Great Horned Owl	0	0.00	5	1.52	3	1.11	2	0.31	2	1.43	12	0.70
Blue Grosbeak	0	0.00	8	2.42	2	0.74	1	0.15	0	0.00	11	0.64
Common Nighthawk	0	0.00	0	0.00	0	0.00	10	1.54	0	0.00	10	0.58
Eastern Kingbird	1	0.30	4	1.21	1	0.37	4	0.62	0	0.00	10	0.58
Rufous-sided Towhee	0	0.00	2	0.61	6	2.22	1	0.15	0	0.00	9	0.52
Lesser Goldfinch	0	0.00	0	0.00	6	2.22	0	0.00	2	1.43	8	0.47
Song Sparrow	1	0.30	1	0.30	4	1.48	1	0.15	0	0.00	7	0.41
Western Wood-Pewee	0	0.00	5	1.52	1	0.37	1	0.15	0	0.00	7	0.41
Grasshopper Sparrow	1	0.30	0	0.00	1	0.37	5	0.77	0	0.00	7	0.41
Common Yellowthroat	3	0.91	2	0.61	2	0.74	0	0.00	0	0.00	7	0.41
Killdeer	5	1.52	0	0.00	0	0.00	0	0.00	2	1.43	7	0.41
Rock Dove	0	0.00	0	0.00	0	0.00	6	0.92	0	0.00	6	0.35
European Starling	0	0.00	0	0.00	6	2.22	0	0.00	0	0.00	6	0.35
Chipping Sparrow	0	0.00	1	0.30	0	0.00	1	0.15	3	2.14	5	0.29

RELATIVE ABUNDANCE SUMMARY, BIRDS

Season/Year: September, 1991

Transects: Baseline, OU1

09-Apr-92

File: RABSEPB1.WK1

Species	WETLAND HABITATS (2.6 Hours)		WOODLAND HABITATS (2.8 Hours)		SHRUBLAND HABITATS (2.5 Hours)		GRASSLAND HABITATS (5.7 Hours)		DISTURBED HABITATS (1.4 Hours)		TOTAL (15.0 Hours)	
	Number	No./Hour	Number	No./Hour	Number	No./Hour	Number	No./Hour	Number	No./Hour	Number	No./Hour
Red-winged Blackbird	130	50.00	0	0.00	1	0.40	0	0.00	0	0.00	131	8.73
Western Meadowlark	1	0.38	21	7.50	8	3.20	70	12.28	11	7.86	111	7.40
House Finch	0	0.00	33	11.79	16	6.40	16	2.81	28	20.00	93	6.20
Vesper Sparrow	4	1.54	4	1.43	4	1.60	24	4.21	6	4.29	42	2.80
Mallard	35	13.46	0	0.00	0	0.00	0	0.00	0	0.00	35	2.33
Pine Siskin	0	0.00	8	2.86	0	0.00	20	3.51	0	0.00	28	1.87
Rufous-sided Towhee	0	0.00	1	0.36	20	8.00	0	0.00	0	0.00	21	1.40
Song Sparrow	7	2.69	4	1.43	9	3.60	0	0.00	0	0.00	20	1.33
Mourning Dove	8	3.08	2	0.71	1	0.40	3	0.53	4	2.86	18	1.20
Chipping Sparrow	7	2.69	2	0.71	6	2.40	3	0.53	0	0.00	18	1.20
Barn Swallow	7	2.69	3	1.07	4	1.60	3	0.53	0	0.00	17	1.13
Wilson's Warbler	2	0.77	12	4.29	3	1.20	0	0.00	0	0.00	17	1.13
Killdeer	14	5.38	0	0.00	0	0.00	0	0.00	0	0.00	14	0.93
Northern Flicker	0	0.00	11	3.93	0	0.00	2	0.35	0	0.00	13	0.87
Black-billed Magpie	0	0.00	4	1.43	6	2.40	1	0.18	0	0.00	11	0.73
Brewer's Sparrow	0	0.00	0	0.00	6	2.40	4	0.70	0	0.00	10	0.67
Clay-colored Sparrow	0	0.00	8	2.86	0	0.00	2	0.35	0	0.00	10	0.67
MacGillivray's Warbler	1	0.38	5	1.79	2	0.80	1	0.18	0	0.00	9	0.60
Yellow-rumped Warbler	0	0.00	8	2.86	0	0.00	0	0.00	0	0.00	8	0.53
Say's Phoebe	1	0.38	6	2.14	0	0.00	1	0.18	0	0.00	8	0.53
Yellow Warbler	0	0.00	1	0.36	7	2.80	0	0.00	0	0.00	8	0.53
American Goldfinch	0	0.00	4	1.43	0	0.00	1	0.18	2	1.43	7	0.47
Common Yellowthroat	0	0.00	0	0.00	7	2.80	0	0.00	0	0.00	7	0.47
European Starling	0	0.00	0	0.00	0	0.00	7	1.23	0	0.00	7	0.47
Tree Swallow	0	0.00	0	0.00	5	2.00	2	0.35	0	0.00	7	0.47
Rock Wren	0	0.00	1	0.36	0	0.00	0	0.00	5	3.57	6	0.40
American Kestrel	1	0.38	2	0.71	0	0.00	3	0.53	0	0.00	6	0.40
Blue Grosbeak	0	0.00	4	1.43	2	0.80	0	0.00	0	0.00	6	0.40

Green-tailed Towhee	0	0.00	2	0.71	3	1.20	0	0.00	0	0.00	5	0.33
Red-tailed Hawk	0	0.00	1	0.36	0	0.00	3	0.53	1	0.71	5	0.33
Great Horned Owl	0	0.00	4	1.43	0	0.00	0	0.00	1	0.71	5	0.33
Lesser Goldfinch	0	0.00	0	0.00	1	0.40	0	0.00	4	2.86	5	0.33
Solitary Vireo	0	0.00	4	1.43	0	0.00	0	0.00	0	0.00	4	0.27
Pied-billed Grebe	3	1.15	0	0.00	0	0.00	0	0.00	0	0.00	3	0.20
Western Flycatcher	0	0.00	1	0.36	2	0.80	0	0.00	0	0.00	3	0.20
Common Grackle	0	0.00	0	0.00	0	0.00	3	0.53	0	0.00	3	0.20
Sage Thrasher	0	0.00	0	0.00	3	1.20	0	0.00	0	0.00	3	0.20
Common Snipe	3	1.15	0	0.00	0	0.00	0	0.00	0	0.00	3	0.20
Ruby-crowned Kinglet	0	0.00	2	0.71	0	0.00	0	0.00	0	0.00	2	0.13
White-crowned Sparrow	0	0.00	2	0.71	0	0.00	0	0.00	0	0.00	2	0.13
Great Blue Heron	2	0.77	0	0.00	0	0.00	0	0.00	0	0.00	2	0.13
Cliff Swallow	2	0.77	0	0.00	0	0.00	0	0.00	0	0.00	2	0.13
Northern Harrier	0	0.00	1	0.36	0	0.00	1	0.18	0	0.00	2	0.13
Townsend's Warbler	0	0.00	1	0.36	0	0.00	0	0.00	0	0.00	1	0.07
Lincoln's Sparrow	0	0.00	1	0.36	0	0.00	0	0.00	0	0.00	1	0.07
Winter Wren	0	0.00	0	0.00	1	0.40	0	0.00	0	0.00	1	0.07
Loggerhead Shrike	0	0.00	0	0.00	0	0.00	0	0.00	1	0.71	1	0.07
Lesser Scaup	1	0.38	0	0.00	0	0.00	0	0.00	0	0.00	1	0.07
Turkey Vulture	0	0.00	0	0.00	1	0.40	0	0.00	0	0.00	1	0.07
Olive-sided Flycatcher	0	0.00	1	0.36	0	0.00	0	0.00	0	0.00	1	0.07
House Wren	0	0.00	0	0.00	1	0.40	0	0.00	0	0.00	1	0.07
Lark Sparrow	1	0.38	0	0.00	0	0.00	0	0.00	0	0.00	1	0.07
Black-capped Chickadee	0	0.00	1	0.36	0	0.00	0	0.00	0	0.00	1	0.07
Common Merganser	1	0.38	0	0.00	0	0.00	0	0.00	0	0.00	1	0.07
Doublecrested Cormorant	1	0.38	0	0.00	0	0.00	0	0.00	0	0.00	1	0.07
Marsh Wren	1	0.38	0	0.00	0	0.00	0	0.00	0	0.00	1	0.07
Downy Woodpecker	0	0.00	1	0.36	0	0.00	0	0.00	0	0.00	1	0.07
American Robin	0	0.00	0	0.00	1	0.40	0	0.00	0	0.00	1	0.07
Common Raven	0	0.00	0	0.00	0	0.00	0	0.00	1	0.71	1	0.07
Red-naped Sapsucker	0	0.00	1	0.36	0	0.00	0	0.00	0	0.00	1	0.07
Peregrine Falcon	0	0.00	0	0.00	0	0.00	1	0.18	0	0.00	1	0.07
Total Species/Habitat	233	89.62	167	59.64	120	48.00	171	30.00	64	45.71	755	50.33

RELATIVE ABUNDANCE SUMMARY, BIRDS

Season/Year: October, 1991

Transects: Baseline, OU1

30-Mar-92

File: RABOCTB1.WK1

Species	WETLAND HABITATS (2.4 Hours)		WOODLAND HABITATS (2.4 Hours)		SHRUBLAND HABITATS (1.0 Hours)		GRASSLAND HABITATS (5.2 Hours)		DISTURBED HABITATS (0.4 Hours)		TOTAL (11.4 Hours)	
	Number	No./Hour	Number	No./Hour	Number	No./Hour	Number	No./Hour	Number	No./Hour	Number	No./Hour
Sandhill Crane	0	0.00	0	0.00	0	0.00	175	33.65	0	0.00	175	15.35
Snow Goose	0	0.00	0	0.00	0	0.00	171	32.88	0	0.00	171	15.00
Canada Goose	0	0.00	0	0.00	0	0.00	100	19.23	0	0.00	100	8.77
Blue-winged Teal	30	12.50	0	0.00	0	0.00	0	0.00	0	0.00	30	2.63
Mallard	30	12.50	0	0.00	0	0.00	0	0.00	0	0.00	30	2.63
Horned Lark	0	0.00	0	0.00	8	8.00	0	0.00	17	42.50	25	2.19
Bufflehead	19	7.92	0	0.00	0	0.00	0	0.00	0	0.00	19	1.67
Black-billed Magpie	0	0.00	4	1.67	9	9.00	2	0.38	0	0.00	15	1.32
Ruby-crowned Kinglet	0	0.00	12	5.00	0	0.00	0	0.00	0	0.00	12	1.05
Pine Siskin	0	0.00	0	0.00	0	0.00	9	1.73	0	0.00	9	0.79
Great Horned Owl	0	0.00	7	2.92	0	0.00	0	0.00	0	0.00	7	0.61
House Finch	0	0.00	3	1.25	1	1.00	3	0.58	0	0.00	7	0.61
Western Meadowlark	0	0.00	2	0.83	0	0.00	3	0.58	0	0.00	5	0.44
Common Crow	0	0.00	0	0.00	0	0.00	5	0.96	0	0.00	5	0.44
Red-tailed Hawk	0	0.00	3	1.25	0	0.00	1	0.19	0	0.00	4	0.35
White-crowned Sparrow	0	0.00	4	1.67	0	0.00	0	0.00	0	0.00	4	0.35
Northern Flicker	0	0.00	3	1.25	0	0.00	0	0.00	1	2.50	4	0.35
Song Sparrow	0	0.00	1	0.42	2	2.00	0	0.00	0	0.00	3	0.26
Common Snipe	0	0.00	1	0.42	2	2.00	0	0.00	0	0.00	3	0.26
Rough-legged Hawk	0	0.00	1	0.42	0	0.00	0	0.00	1	2.50	2	0.18
Common Raven	0	0.00	0	0.00	0	0.00	2	0.38	0	0.00	2	0.18
Northern Harrier	1	0.42	0	0.00	0	0.00	1	0.19	0	0.00	2	0.18
American Kestrel	0	0.00	1	0.42	0	0.00	1	0.19	0	0.00	2	0.18
Ferruginous Hawk	0	0.00	1	0.42	0	0.00	0	0.00	0	0.00	1	0.09
Pied-billed Grebe	1	0.42	0	0.00	0	0.00	0	0.00	0	0.00	1	0.09
Lesser Scaup	1	0.42	0	0.00	0	0.00	0	0.00	0	0.00	1	0.09
Ring-billed Gull	0	0.00	0	0.00	0	0.00	1	0.19	0	0.00	1	0.09
Mourning Dove	0	0.00	1	0.42	0	0.00	0	0.00	0	0.00	1	0.09

RELATIVE ABUNDANCE SUMMARY, BIRDS

Season/Year: November, 1991

Transects: Baseline, OUI

09-Apr-92

File: RABNOVB1.WK1

	WETLAND HABITATS (2.7 Hours)		WOODLAND HABITATS (2.1 Hours)		SHRUBLAND HABITATS (2.0 Hours)		GRASSLAND HABITATS (4.8 Hours)		DISTURBED HABITATS (1.5 Hours)		TOTAL (13.1 Hours)	
Species	Number	No./Hour	Number	No./Hour	Number	No./Hour	Number	No./Hour	Number	No./Hour	Number	No./Hour
Mallard	27	10.00	0	0.00	0	0.00	5	1.04	0	0.00	32	2.44
European Starling	0	0.00	29	13.81	0	0.00	0	0.00	0	0.00	29	2.21
Black-billed Magpie	0	0.00	4	1.90	13	6.50	9	1.88	1	0.67	27	2.06
Bufflehead	26	9.63	0	0.00	0	0.00	0	0.00	0	0.00	26	1.98
American Tree Sparrow	1	0.37	2	0.95	5	2.50	4	0.83	8	5.33	20	1.53
American Goldfinch	0	0.00	0	0.00	0	0.00	12	2.50	0	0.00	12	0.92
Northern Flicker	0	0.00	7	3.33	0	0.00	0	0.00	1	0.67	8	0.61
Great Horned Owl	0	0.00	8	3.81	0	0.00	0	0.00	0	0.00	8	0.61
House Finch	0	0.00	0	0.00	0	0.00	8	1.67	0	0.00	8	0.61
Common Raven	0	0.00	1	0.48	0	0.00	4	0.83	0	0.00	5	0.38
Common Goldeneye	3	1.11	0	0.00	0	0.00	0	0.00	0	0.00	3	0.23
American Kestrel	0	0.00	2	0.95	0	0.00	0	0.00	1	0.67	3	0.23
Lesser Scaup	2	0.74	0	0.00	0	0.00	0	0.00	0	0.00	2	0.15
Pine Siskin	0	0.00	0	0.00	0	0.00	2	0.42	0	0.00	2	0.15
Blue-winged Teal	2	0.74	0	0.00	0	0.00	0	0.00	0	0.00	2	0.15
Green-winged Teal	1	0.37	0	0.00	0	0.00	0	0.00	0	0.00	1	0.08
Song Sparrow	0	0.00	1	0.48	0	0.00	0	0.00	0	0.00	1	0.08
Common Snipe	0	0.00	0	0.00	1	0.50	0	0.00	0	0.00	1	0.08
Dark-eyed Junco	0	0.00	0	0.00	1	0.50	0	0.00	0	0.00	1	0.08
Ring-necked Pheasant	0	0.00	0	0.00	1	0.50	0	0.00	0	0.00	1	0.08
Northern Harrier	0	0.00	1	0.48	0	0.00	0	0.00	0	0.00	1	0.08
Ring-billed Gull	0	0.00	0	0.00	0	0.00	1	0.21	0	0.00	1	0.08
Total Species/Habitat	62	22.96	55	26.19	21	10.50	45	9.38	11	7.33	194	14.81

RELATIVE ABUNDANCE SUMMARY, BIRDS

Season/Year: December, 1991

Transects: Baseline, OUI, OU5

09-Apr-92

File: RABDECB1.WK1

	WETLAND HABITATS (5.4 Hours)		WOODLAND HABITATS (4.4 Hours)		SHRUBLAND HABITATS (3.2 Hours)		GRASSLAND HABITATS (6.6 Hours)		DISTURBED HABITATS (2.6 Hours)		TOTAL (22.2 Hours)	
Species	Number	No./Hour	Number	No./Hour	Number	No./Hour	Number	No./Hour	Number	No./Hour	Number	No./Hour
American Tree Sparrow	0	0.00	21	4.77	2	0.63	0	0.00	0	0.00	23	1.04
Great Horned Owl	0	0.00	13	2.95	0	0.00	1	0.15	0	0.00	14	0.63
Common Raven	2	0.37	2	0.45	5	1.56	1	0.15	2	0.77	12	0.54
Northern Flicker	0	0.00	7	1.59	0	0.00	0	0.00	2	0.77	9	0.41
Black-billed Magpie	2	0.37	1	0.23	4	1.25	1	0.15	0	0.00	8	0.36
Mallard	6	1.11	0	0.00	0	0.00	0	0.00	0	0.00	6	0.27
Red-tailed Hawk	0	0.00	1	0.23	1	0.31	2	0.30	1	0.38	5	0.23
American Kestrel	0	0.00	3	0.68	0	0.00	0	0.00	2	0.77	5	0.23
Northern Harrier	1	0.19	0	0.00	0	0.00	3	0.45	0	0.00	4	0.18
Song Sparrow	3	0.56	0	0.00	0	0.00	0	0.00	0	0.00	3	0.14
Golden Eagle	1	0.19	0	0.00	0	0.00	1	0.15	0	0.00	2	0.09
Rough-legged Hawk	1	0.19	0	0.00	0	0.00	0	0.00	1	0.38	2	0.09
Loggerhead Shrike	0	0.00	1	0.23	0	0.00	0	0.00	0	0.00	1	0.05
Merlin	0	0.00	1	0.23	0	0.00	0	0.00	0	0.00	1	0.05
Northern Shrike	0	0.00	1	0.23	0	0.00	0	0.00	0	0.00	1	0.05
Horned Lark	1	0.19	0	0.00	0	0.00	0	0.00	0	0.00	1	0.05
Harris' Sparrow	0	0.00	1	0.23	0	0.00	0	0.00	0	0.00	1	0.05
Townsend's Solitaire	1	0.19	0	0.00	0	0.00	0	0.00	0	0.00	1	0.05
Total Species/Habitat	18	3.33	52	11.82	12	3.75	9	1.36	8	3.08	99	4.46

RELATIVE ABUNDANCE SUMMARY, BIRDS

Season/Year: January, 1992

09-Apr-92

Transects: Baseline, OU1, OU5

File: RABJANB1.WK1

	WETLAND HABITATS (5.0 Hours)		WOODLAND HABITATS (5.0 Hours)		SHRUBLAND HABITATS (3.5 Hours)		GRASSLAND HABITATS (9.5 Hours)		DISTURBED HABITATS (2.5 Hours)		TOTAL (25.5 Hours)	
Species	Number	No./Hour	Number	No./Hour	Number	No./Hour	Number	No./Hour	Number	No./Hour	Number	No./Hour
Black-billed Magpie	1	0.20	10	2.00	5	1.43	7	0.74	2	0.80	25	0.98
American Tree Sparrow	0	0.00	12	2.40	1	0.29	0	0.00	0	0.00	13	0.51
Northern Flicker	0	0.00	9	1.80	1	0.29	1	0.11	1	0.40	12	0.47
Common Raven	0	0.00	1	0.20	1	0.29	7	0.74	3	1.20	12	0.47
Great Horned Owl	0	0.00	10	2.00	0	0.00	0	0.00	0	0.00	10	0.39
Song Sparrow	4	0.80	2	0.40	1	0.29	0	0.00	0	0.00	7	0.27
Mallard	6	1.20	0	0.00	0	0.00	0	0.00	0	0.00	6	0.24
American Kestrel	0	0.00	2	0.40	0	0.00	1	0.11	1	0.40	4	0.16
Golden Eagle	0	0.00	0	0.00	0	0.00	3	0.32	0	0.00	3	0.12
Horned Lark	0	0.00	0	0.00	0	0.00	3	0.32	0	0.00	3	0.12
Northern Harrier	0	0.00	1	0.20	0	0.00	1	0.11	0	0.00	2	0.08
Common Snipe	0	0.00	1	0.20	0	0.00	0	0.00	0	0.00	1	0.04
Northern Shrike	0	0.00	1	0.20	0	0.00	0	0.00	0	0.00	1	0.04
Prairie Falcon	0	0.00	0	0.00	0	0.00	0	0.00	1	0.40	1	0.04
Red-tailed Hawk	0	0.00	1	0.20	0	0.00	0	0.00	0	0.00	1	0.04
Rock Dove	0	0.00	0	0.00	0	0.00	0	0.00	1	0.40	1	0.04
Rough-legged Hawk	0	0.00	0	0.00	0	0.00	1	0.11	0	0.00	1	0.04
American Goldeneye	1	0.20	0	0.00	0	0.00	0	0.00	0	0.00	1	0.04
Ring-necked Pheasant	0	0.00	0	0.00	0	0.00	0	0.00	1	0.40	1	0.04
Downy Woodpecker	0	0.00	1	0.20	0	0.00	0	0.00	0	0.00	1	0.04
Total Species/Habitat	12	2.40	51	10.20	9	2.57	24	2.53	10	4.00	106	4.16

Transects: Baseline, OU1, OU5

30-Mar-92

File: RABFEBB1.WK1

30-Mar-92

File: RAMDECB1.WK1

Transects: Baseline, OU1, OU5

File: RAMJANB1.WK1

Transects: Baseline, OU1, OU5

30-Mar-92

File: RAMFEBB1.WK1

Transects: Baseline

30-Mar-92

File: RAMMARB1.WK1

Transects: Baseline

30-Mar-92

File: RAMAPRB1.WK1

Transects: Baseline

30-Mar-92

File: RAMMAYB1.WK1

Transects: Baseline, OU1

30-Mar-92

File: RAMJUNB1.WK1

Season/Year: July, 1991
Transects: Baseline, OUI

File: RAMJULB1.WK1

Transects: Baseline, OU1

30-Mar-92

File: RAMAUGB1.WK1

Transects: Baseline, OU1

30-Mar-92

File:RAMSEPB1.WK1

Transects: Baseline, OU1

30-Mar-92

File: RAMOCTB1.WK1

Season/Year: November, 1991

30-Mar-92

387
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RELATIVE ABUNDANCE SUMMARY, BIRDS

Season/Year: March, 1991

Transects: Baseline

30-Mar-92

File: RABMARB1.WK1

	WETLAND HABITATS (2.8 Hours)		WOODLAND HABITATS (1.8 Hours)		SHRUBLAND HABITATS (2.9 Hours)		GRASSLAND HABITATS (2.9 Hours)		DISTURBED HABITATS (1.4 Hours)		TOTAL (11.8 Hours)	
Species	Number	No./Hour	Number	No./Hour	Number	No./Hour	Number	No./Hour	Number	No./Hour	Number	No./Hour
Redhead	77	27.50	0	0.00	0	0.00	0	0.00	0	0.00	77	6.53
Horned Lark	0	0.00	0	0.00	0	0.00	30	10.34	0	0.00	30	2.54
Mallard	28	10.00	0	0.00	0	0.00	0	0.00	0	0.00	28	2.37
Common Raven	0	0.00	5	2.78	6	2.07	4	1.38	0	0.00	15	1.27
Black-billed Magpie	3	1.07	3	1.67	7	2.41	0	0.00	0	0.00	13	1.10
Western Meadowlark	1	0.36	4	2.22	5	1.72	1	0.34	0	0.00	11	0.93
Green-winged Teal	9	3.21	0	0.00	0	0.00	0	0.00	0	0.00	9	0.76
Lesser Scaup	7	2.50	0	0.00	0	0.00	0	0.00	0	0.00	7	0.59
Song Sparrow	2	0.71	1	0.56	4	1.38	0	0.00	0	0.00	7	0.59
Rough-legged Hawk	1	0.36	0	0.00	0	0.00	5	1.72	0	0.00	6	0.51
American Goldeneye	5	1.79	0	0.00	0	0.00	0	0.00	0	0.00	5	0.42
Great Horned Owl	0	0.00	2	1.11	2	0.69	0	0.00	0	0.00	4	0.34
Red-winged Blackbird	0	0.00	0	0.00	3	1.03	0	0.00	1	0.71	4	0.34
Northern Flicker	0	0.00	1	0.56	2	0.69	0	0.00	0	0.00	3	0.25
Canvasback	2	0.71	0	0.00	0	0.00	0	0.00	0	0.00	2	0.17
Rock Dove	0	0.00	2	1.11	0	0.00	0	0.00	0	0.00	2	0.17
Red-tailed Hawk	0	0.00	1	0.56	1	0.34	0	0.00	0	0.00	2	0.17
Short-eared Owl	0	0.00	0	0.00	1	0.34	0	0.00	0	0.00	1	0.08
Loggerhead Shrike	0	0.00	0	0.00	1	0.34	0	0.00	0	0.00	1	0.08
Ring-necked Pheasant	0	0.00	1	0.56	0	0.00	0	0.00	0	0.00	1	0.08
Dark-eyed Junco	0	0.00	0	0.00	1	0.34	0	0.00	0	0.00	1	0.08
Common Snipe	1	0.36	0	0.00	0	0.00	0	0.00	0	0.00	1	0.08
Ring-billed Gull	0	0.00	0	0.00	0	0.00	1	0.34	0	0.00	1	0.08
Lapland Longspur	0	0.00	0	0.00	0	0.00	1	0.34	0	0.00	1	0.08
Total Species/Habitat	136	48.57	20	11.11	33	11.38	42	14.48	1	0.71	232	19.66